ELECTRICAL REVIEW

[ILLUSTRATED.]

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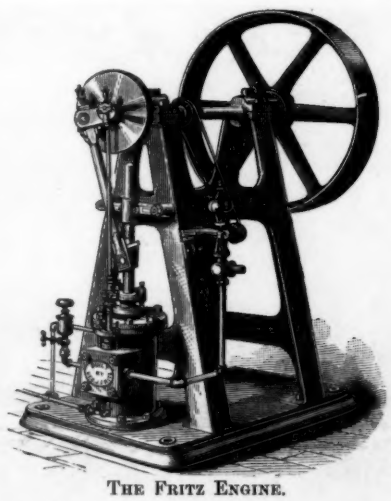
Fritz's Electric Light Engines.

The cuts accompanying this article illustrate the patent electric light engines of Geo. J. Fritz, of St. Louis, Mo. These engines are built especially to furnish power for electric light plants, are new in design and take up but little space. The cuts represent single and double engines, the former being made in sizes ranging from 4 to 12 horse-power; the latter from 15 to 25 horse-power. The inventor, who is a practical engine man of many years' experience, has perfected an engine that will undoubtedly be in great demand, particularly in the electric light field, and one that is guaranteed to give satisfaction in every respect. On the Mississippi steamboats these engines are very popular, and are used by not less than a dozen of the large boats for running their electric lights. Where room is valuable, these engines are very desirable and convenient. Everybody likes to see an engine of fine appearance as well as of good working parts, and in the Fritz engine will be found this happy combination.



THE FRITZ ENGINE.

Tones and Vibrations.

C. C. HASKINS.

It is a conceded fact in acoustics that the pitch of any sound is an index of the rate of vibration of the moving body originating that tone; and conversely, that a known rate of vibration must of necessity produce a definite tone or note which is inseparable from that rate of vibration.

Another fixed, and as easily demonstrated fact, is that when a given rate of vibration is doubled, that is when the vibrating body is caused to vibrate twice as rapidly as before, the same tone is produced, but the note will be exactly an octave above the former.

But the sound—the timbre—the quality of the tone emitted, while of the same pitch, may be pleasant or objectionable, soft, harsh, flute-like, rasping, soothing, or almost maddening in its effect upon the human ear, depending upon the material of the sound source, and its capacity for setting up minor vibrations in combination with the fundamental or principal tone.

The same note struck upon a piano, a zither, a flute a clarionet and a pipe organ, will give as many different qualities of tone as there are instruments, and yet each will produce precisely the same tone pitch as the other. So of the human voice. Hardly a person in the whole range of one's acquaintance is capable, even intentionally, of imitating another's voice nearly enough to deceive the listener in the dark, and friends who have not met for years, whose appearance, changed by time or accident, has rendered them unrecognizable by sight, will at once remember the voice, from its peculiar quality of tone—its individuality.

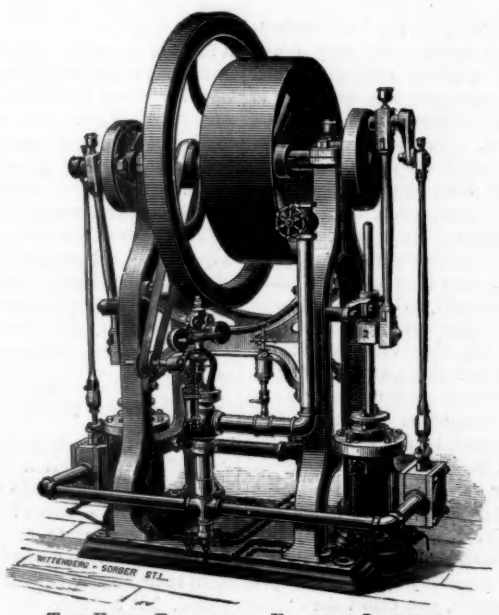
There are human voices which are musical in conversation, and there are singers in whose tones there is so little of musical excellence as to be decidedly unpleasant to the listener—and between these two extremes there are all grades and peculiarities of tone. I am not now referring to voices in which there are natural impediments—nasal articulation, imperfect intonation, and the like—but voices perfect in all these characteristics, which vary in what may be termed musical richness. All this is a matter of undertones commingling with the fundamental tone, either spoken or sung.

And, it is also a curious fact that if two groups of singers, say quartettes, either of which performs well, be so re-organized as to make two new combinations of these by exchanging bases or tenors, sopranos or altos, the quality of the vocal harmony will be changed materially, for better or worse, in nearly every instance.

I knew a case where in a large vocal chorus there were two singers, either of whom was acceptable to an audience, and, what is somewhat remarkable, both were free from the proverbial jealousy of musicians, and firm friends. Yet, the timbre of the two voices was so dissimilar that when standing next each other, neither sang as well as when separated by two or three intermediate voices; and it really marred the chorus when the two friends were within elbow distance of each other.

I have made this digression in the hope of more thoroughly explaining to a class of readers whom I hope to reach, and answering a question which is often asked: "Why is the sound of one musical instrument so different from another?"

There is a limit to the hearing capacity of the human ear. Its nerve harp is sensitive to vibrations which are embraced between 16 to the second, and 40,000 to the second. Occasionally an anomalous instance is recorded where these limits were exceeded in one direction, but they are rare.



THE FRITZ ENGINE FOR ELECTRIC LIGHTING.

Sir John Lubbock, with an instrument similar to the siren—which we shall know more of by and by—produced sounds which were inaudible to listeners, but which were powerfully effective on insect life, killing mosquitos, and other winged animals of the lower orders. There can be no doubt that among the myriads of minute flying creatures, noiseless to humanity, there are tones produced by muscular vibrations which enable them to seek and avoid each other as friends or as enemies.

The methods of artificially producing various tones are several. The siren, of which I have spoken above, is one of, if not the first, successful one of these. It consists, briefly described, of two parallel plates of metal, through which holes are drilled for the passage of a current of air or steam. One of these plates is stationary, and through this the openings are perpendicular to the face of the plate. In the other, an equal number of perforations are drilled, but these are cut through at an angle, so that when they are directly over the corresponding holes in the stationary plate, and a current of air is forced through the hole in the stationary plate, the in-rushing air will rotate the movable plate. As this plate revolves by the pressure of the air, it alternately cuts off and opens these ports, and when this motion is sufficiently rapid the puffing of the air produces a tone, which rises in pitch as the speed increases. Attached to the apparatus is a train of clock work which counts the revolutions, and thus tells the tone which is being produced.

Several forms of electrical tone producers have been suggested. One of these consisted of clock work, or other mechanism which alternately dipped and withdrew from mercury cups, two needle points; the circuit being completed through an electro-magnet when these were immersed, and broken when they were withdrawn—something on the principle of a vibrating bell-hammer. An ordinary telegraphic relay may be made to hum by cross-connecting the local and main circuits, which has the result of alternately sending the current through the coils and through the local circuit. In some of the old, old time relays which we used when boys, this cross-circuiting was done by the makers, and the unintentional imperfection gave no little annoyance on fine adjustments.

In Gray's harmonic system the tones required are formed on the same principle. By alternately making and breaking a local current the vibrations of a modified tuning fork, which acts as an armature between two electro-magnets, sends a vibratory current to line, and this on arriving at the receiving point actuates a second armature, tuned to respond to that number of vibrations. An electrical siren has recently been invented by Dr. R. Weber, which is perhaps more complete than previous instruments of this character. It is a farther development of one of the oldest rheotomes.

In this the periphery of a cylinder formed of discs, is cut into teeth, the intermediate spaces being filled level with an insulating material. In the length of the cylinder are as many different discs, insulated from each other, as the number of tones desired. In the one described there are 15. In the first disc there are 24 teeth; in the second 27; the third has 30, and so on. The insulation being brought up flush with the face of the teeth, the cylinder is perfectly smooth and uniform throughout. The circuit is formed by arranging the battery in parallel series. All the positive elements, for instance, are connected, while from each negative element a wire leads to a spring resting on one of the disc sections of the cylinder, from thence to

the shaft of the cylinder by one general terminal to a telephone, and from the telephone to the positive terminal. In the branch which leads through each disc a key is placed.

The cylinder is rotated by a pulley. Now, whatever note or combination of notes is required can be produced by depressing one or more keys. In another form described, induced currents are used instead of primary. The number of revolutions of the cylinder multiplied by the number of teeth in the wheel, gives the number of vibrations in a given time. The inventor suggests the possibility of using telephones in connection with this siren, as an electrical organ. For modifying the tones, a soft pedal stop, which would throw resistance coils into the circuit, and thus reduce the volume of sound is proposed.

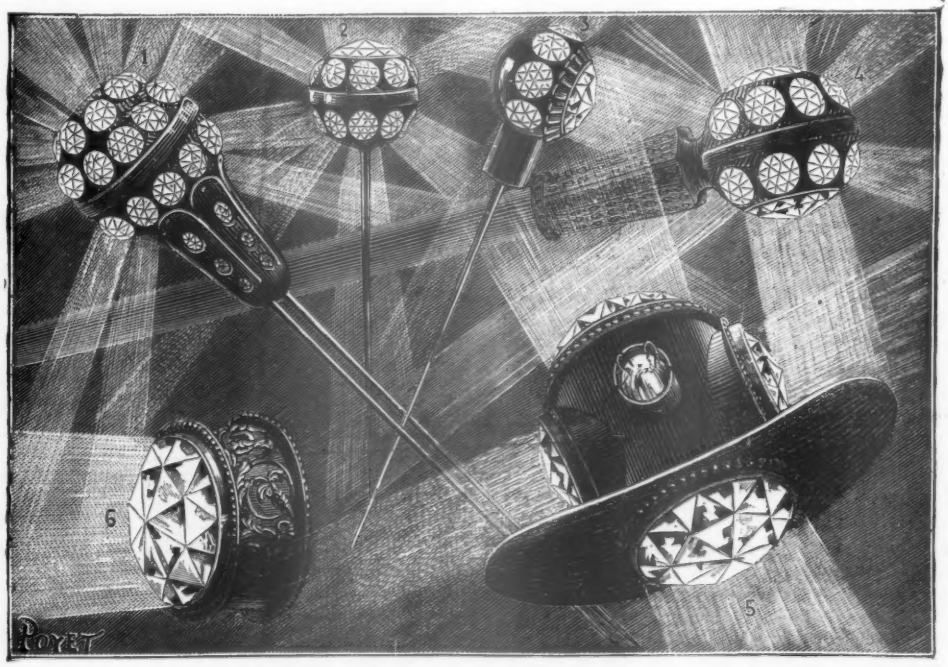
In Gray's harmonic musical telegraph, this same result is successfully accomplished by a further elaboration of his circuit breaker or rheotome idea, mentioned above. A number of these, as many as are desired, each attuned to its particular pitch, are kept in constant vibration by means of individual local batteries. A set of keys like those of an organ or piano are arranged so that by depressing one of these, a section of the main battery is sent to line through the vibrating contact of the tuning fork or spring. At the receiving end of the line the correspondingly tuned armature responds. The receiving magnet with its tuned armature is mounted on a hollow resonating box, corresponding in size to the tone of the instrument it supports, and thus amplifies the sound.

With a key board in Chicago and the receiving instruments in Milwaukee this instrument has been heard plainly throughout a large hall—full harmony, as well as single notes. It is hardly practicable, however, to do this successfully over railroad wires, as, when it is advertised that such an exhibit is to take place, the operator at every road crossing and way office throws his relay in circuit, and by close adjusting gets up a little side show of his own to the detriment of the principle exhibit—the resistances of the many relays materially reducing the volume of sound, just as proposed by Dr. Weber in the soft-pedal attachment to his organ.

A very rude experiment may be made which is within the reach of everyone, and will well illustrate the tones arising from slow and rapid vibrations. Take a coarse rasp and varnish it thoroughly with shellac varnish, being sure to fill all the interstices. When dry, rub the face of the file with a whet-stone, or fine emery paper, just sufficient to wear off the varnish from the face of the file, leaving the insulation between the teeth. One or two cells of battery are connected to the file, and a hand telephone—the other terminal of the telephone having a short piece of wire with which to scratch the file. Drawing the wire slowly along the face of the file, a sound of comparatively low pitch will be heard. Increasing this motion will raise the pitch to almost any desired degree. The circuit, if the combination has been properly arranged, will be broken between each two teeth of the file, and the experiment will prove practically that tones bear a direct ratio to rapidity of vibrations.

Trouve's Jewelry.

This jewelry we have mentioned before, and is a subject not altogether new. The illustrations in this issue will give our readers an excellent idea of this "flash" jewelry. The study of economic science shows us that a large part of the human race has to be satisfied if it can obtain necessaries, while another part can revel in luxuries. Many of M. Trouve's exhibits partake of the luxurious, in that they show how the electric light lends itself to artistic decoration. We do not know whether the flash jewelry so largely used for theatrical effects is to be classed as luxurious and decorative, but we do know that M. Trouve has a large number of specimens of this kind of jewelry. Our readers are probably all familiar with M. Trouve's secondary batteries and incandescent lamps for mining and other purposes, which we have described before. His investigations have led him to devise several forms.



TROUVE'S ELECTRIC JEWELRY.

Electricity in the Navy.

The following is an abstract of a lecture delivered by Lieutenant A. W. Chisholm-Batten, R. N., of the torpedo ship "Vernon," at the Royal United Service Institute, on the 29th ultimo, on "Electricity as Applied to Naval Purposes." He pointed out that there was no sharply defined line between the application of electricity for general and for war purposes. It was a great power in skilled hands, and could be used with safety and certainty even by slightly trained men if only enough care and thought were taken in designing the appliances so as to make their use easy and abuse difficult. Having given a brief description of how electricity for naval purposes is generated, he drew attention to its great use for illuminating purposes on board ship, the only drawback being that a failure resulted in total darkness, and great care was necessary to prevent the current affecting the compasses and chronometers. For the search light for discovering torpedo boats approaching, and for bombarding forts the arc light was needed, and by it a boat could be discovered at a great distance. Much use had been made of this light at Alexandria and Suakim. For signaling it had been used for years, and had been distinctly visible at 31 miles from the ship. For internal communications electricity was very valuable in ships, the applications for this purpose being already very numerous and on the increase continually. Telephones are used from ships, when moored, to the shore, and this communication has been found very useful on board the "Vernon;" and, in co-operation with the glow lamp, it was found very valuable for diving, and had already been the means of saving life. Electricity had been already successfully applied to the propulsion of launches, one called the "Australia," with a speed of seven or eight knots, having been built for £180. The application of electricity to war purposes was first in firing guns singly or by broadsides; offering great advantages in the latter case of all the guns being fired exactly at the same moment. An observer, who has not been incommoded by smoke, is therefore able to time the discharge when it will be most effective. In a heavy sea the guns can be fired at the moment the ship is upright. Electricity has proved most valuable for firing, propelling, and discharging torpedoes, a name strangely enough derived from the electric fish. For firing star torpedoes electricity is now exclusively used, and also for firing towing torpedoes, and it was now being applied to firing, propelling, and steering the fish torpedo of the type known as Sims', which is considered to have long range, handiness with the helm, a heavy charge, security from an enemy's fire, power of passing floating obstructions, not being easily seen or stopped by an enemy, its motive power always ready and not dangerous, constant speed to the end of its run, and its charge is exploded at a proper depth, to a greater degree than those of Ericssen, Lay, Howell, and Whitehead. It is made in two sizes, the larger carrying two miles of copper wire and 400 lbs. of dynamite. The Paulson torpedo is steered by electricity, while all torpedoes started from below the deck are discharged by electrical signals. Submarine mines, which might be defined as stationary torpedoes, could be fired either by contact or by electricity at will. In explaining the latter, which is called double observation firing or plane table firing, he said it had the disadvantage of not being applicable at night or in a fog. To obviate this, electro-contact mines were used, in which a ship blew herself up by running against one of a number of mines. The torpedo detector consists of a sinker or heavy case and a box carried in the boat from which the cable hangs. The sinker is dragged slowly along the bottom, and when it comes in contact with a mass of magnetic metal, such as a torpedo case, a humming noise is set up in the box, indicating the fact to those in the boat. In every case the various appliances were shown in actual use by the lecturer, who had skilled assistance from the "Vernon."

The Electrical Transmission of Power.

We have not yet (*Bulletin International des Telephones*) received an authorized explanation of the unsatisfactory results of M. Marcel Deprez's tests of the dynamos constructed according to his designs. Defects in the mechanical construction and insufficient insulation of the wires have been suggested, but it seems that these are not the only causes. On the contrary, it is a question of remaking the machine integrally; which would lead us to suppose that the evil is not in such or such a detail, but in the principle itself, adopted by the inventor. We would, therefore, attribute to the so-called Foucault currents the absolutely insufficient rendering shown in the preparatory trials This is not the first time that we have heard of Foucault currents, and a long time before the question of transmission of power to a distance was raised, one of the most distinguished electricians, Dr. Froelich, had pointed out the difficulties which they caused. In April and May, 1881, therefore, more than four years ago, this savant published, in the *Elektrotechnische Zeitschrift*, a remarkable study on dynamo-electric machines and the transmission of power by electricity. On comparing the theoretical formulæ with observed results, he was struck by a want of concordance, which he explained by the action of the Foucault currents, that is to say, the induction currents which are produced in the iron of the ring. "The principal cause of these currents," said he, is "the action which the magnetism of the electro-magnets exercises upon the iron core of the ring; in consequence of the rotation, currents must be established in this iron in the same manner as in the copper wire. In the primary machine (generator) the currents of induction weaken the electromotive force and increase the energy absorbed; in the secondary machine (receiver) these currents of induction strengthen the electromotive force and diminish the energy produced." In the numerous experiments which led to these conclusions, the work done was always in reality less, and, on the contrary, the electromotive force of the secondary machine greater than theory indicated. Dr. Froelich thus made evident a fact which deserved attention, namely, the necessity of knowing exactly what to understand by the term Foucault currents. The phenomena do not seem yet to have been elucidated, and the first test of the machines at Creil shows that there still remain many obscure points, even in theories considered the most perfect. In the previous trials at Munich, and at the Gare du Nord, M. Marcel Deprez had no such surprise, because he worked with machines of comparatively low power, and he employed Gramme dynamos, in which a few details only had been modified. With new types he must proceed with studies which are the more necessary, as the labors of his predeccssors cannot serve him in the path in which he is engaged.

A "Telpher" Line.

Considerable interest has been aroused, says the London *Electrical Review*, by an experiment which is shortly to be made at the Sussex Portland Cement Works, at the small village of Heighton, near Newhaven. It is proposed to carry the clay from these works by electricity. A "telpher" motor, running on a single steel rod, is to serve as a locomotive, dragging behind it a number of trucks. The line, which will be formed of a ¾-inch steel rod, resting upon cast iron saddles, and supported by braceposts and a crossbeam, will be raised, as a rule, about 12 feet above the ground, but in some instances 16 feet. The supports will be about 66 feet apart. There is to be an "up" line and a "down" line. It is stated that it is incomparably cheaper to build a "telpher" line in the air than to lay a line of double rails on the ground, requiring bridges, foundations, etc. The engine is stationed near the Glynde station at a point where the telpher line crosses the Glynde reach. The buckets conveying the clay are carried to the special siding, where they tip themselves over and empty their contents into the trucks held in readiness beneath, and which are in due course run along the railway to the Heighton Works. So confident is the company controlling Prof. Fleeming Jenkins' patents of the success of this new method of locomotion, which is now to be tested for the first time on a large scale, that it has undertaken to erect the Glynde line entirely at its own expense, and to take all risk. It has also bound itself to convey for a year 150 tons per week of the clay, and if not successful in so doing to bear the entire loss

The Wiswell Ore Pulverizer and Electric Amalgamator.

This machine, of which the accompanying illustration shows the construction, is one of the most simple of ore pulverizers. It consists of four heavy chasing rollers running in a pan. Any degree of fineness for the ore can be kept in the pan as long as desired. As a simple amalgamator, it should give the excellent results obtained in an arrastra, but the work of crushing is greatly lessened. The apparatus is so simple that it needs no further description. The claims made for it are:

That its first cost is less than that of stamps to do the same work.

That it requires less power to run it.

The wear and tear is but a small part of that of stamps.

That it grinds to a uniform fineness, that it does not flour the mercury, and that the pan can be cleaned up in a few minutes and without stopping the mill.

The manufacturers also claim that a current of electricity passed through the machine while in operation tends to keep the mercury clean, and gives higher results than can be obtained without it; but the machine can be run either with or without the electric current, which can be turned on or off, as may be desired. It is said to have a capacity of one ton an hour.

Tests made in the sample mill of the manufacturers are stated to have demonstrated all the claims made for this machine, and as a number have been ordered and are put to work in different parts of the country, the full working returns can now be obtained by addressing the manufacturers, No. 4 Post Office Square, Boston. The great simplicity of the machine, and its evident durability, commend it to those having ores and tailings, to which it is specially adapted.

A New Application of Electricity.

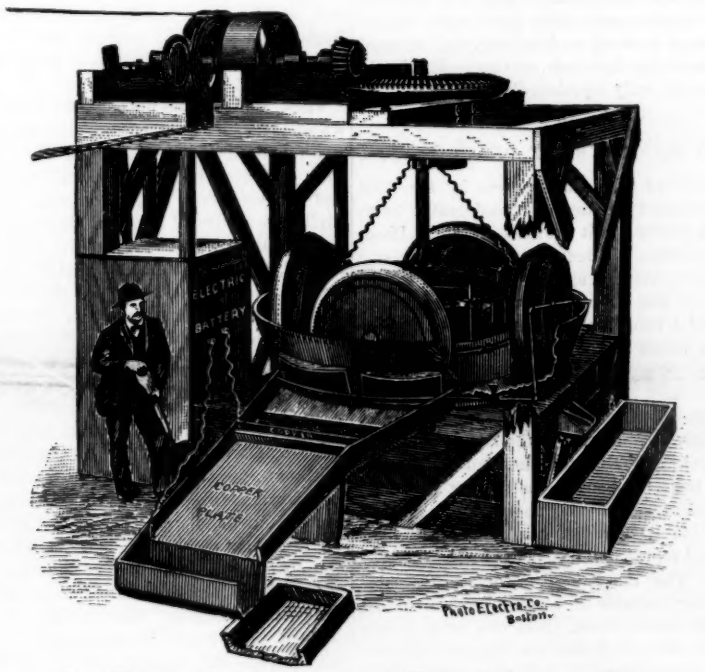
A new and interesting application of electricity, in a somewhat unexpected direction, has formed the subject of some recent investigations by Mr. Alfred O. Walker, of Chester.

Our readers may have noticed, in the autumn of last year, reports of a lecture read by Professor Lodge, of Liverpool, on the subject of "Dust." Papers were first read by Professor Lodge in this country, and the subject was afterwards more extensively dealt with in a lecture which he delivered at Montreal, during the meeting of the British Association.

In the course of these lectures, the professor brought before his hearers the curious observations which he had made as to the effect of a discharge of high-tension electricity from a point, or points, into glass jars or other vessels containing dust of any kind in suspension. He also made interesting and striking experiments illustrating his remarks. Thus, if a bell-jar be filled with a dense smoke of magnesia, by burning some magnesium wire inside it, a very long time elapses before the magnesia settles out and leaves the glass clear of smoke. But if a metallic point be introduced into the jar, connected by a wire to one of the poles of a good frictional, or induction, electric machine, it is only necessary to set the machine to work, and almost instantly an extraordinary effect is observed inside the bell-jar. The magnesia smoke commences to whirl about, and then forms itself into large flakes and strings, which rapidly settle on the bottom and sides, leaving the jar perfectly clear of smoke. What would have taken several hours to settle in the ordinary course, is completely cleared and deposited in a few seconds. The same effect is produced if the jar is filled with any kind of smoke, that from thick paper, or from a cigar, being acted upon exactly in the same manner as the magnesia. Professor Lodge told his audience that he and his assistant had made experiments on a very much larger scale than those in the glass jars. Rooms had been filled with dense smoke, and rapidly cleared in the above manner.

A report of one of these lectures appeared in our contemporary, *Nature*, and was read by Mr. A. O. Walker. This gentleman is one of the partners in the well-known firm of Walker, Parker & Co., lead smelters and manufacturers, and it at once struck him that in these observations and experiments of Professor Lodge might be contained the means of solving one of the principal problems with which a lead smelter has to deal, viz., the condensation of the "fume," or volatilized lead, from the furnaces. Various forms of apparatus have been from time to time proposed as "fume condensers," but with little or no success, the best results being so far obtained by passing the fumes from the furnaces through long flues and chambers. At the large works belonging to Walker, Parker & Co., at Bagillt, in North Wales, the flues and chambers have a total length of over two miles, and still the condensation and deposition of the lead fume is far from complete.

Mr. Walker at once communicated with Professor Lodge on the subject, and the matter being considered very promising, it was decided at once to try experiments on a practical scale. These were carried out by Mr. Walker at the works at Bagillt, with the assistance of the manager, Mr. W. M. Hutchings. Prof. Lodge himself gave scientific advice and assistance on special points. The results of the experiments, which were carried on during many weeks, were extremely satisfactory, and fully bore out Mr. Walker's hopes and expectations.



The Wiswell Ore Pulverizer and Electric Amalgamator.

By means of large casks, a wooden flue was constructed at right angles to one of the main flues of the works, and with a damper on the main flue it was possible to make any required amount of the fumes from a group of furnaces pass into and through the wooden experimental flue. This latter was provided with glass windows, placed opposite one another for the purpose of observation. It also had dampers, by means of which it could be filled with the furnace fumes and then closed at both ends, so that it formed a chamber representing the professor's bell-jars on a very large scale.

The electric machine employed was on the Voss system, the glass disc being 18 inches in diameter. It was worked in a small shed erected close to the experimental flue. One pole of the machine being connected with the ground, the other was connected to an arrangement of metallic points placed inside the flue, and exactly between two of the windows above mentioned. A well-insulated copper wire led from the pole to the top of a stout brass rod, which was fixed in the top of the flue, projecting some distance above it, and reaching so far into it as was necessary to sustain the discharge points in the desired position. This brass rod was fixed inside a glass tube of considerably larger diameter, in order to insulate it where it passed through the top of the flue. During the experiments several different arrangements of discharge points were used, as, for instance, a brass ball having spikes projecting from it all round, a ring with spikes fixed upon it pointing in all directions, a cross studded with spikes in a similar manner, etc.

The electric machine, being kept dry and warm in the shed, worked in a very satisfactory manner during all weathers, giving sparks some four inches in length.

The first experiments tried were upon the lead fume in a state of quiet; that is, the flue was filled with fume by allowing a strong current of it to pass through from the main flue, and then simultaneously closing the inlet and outlet dampers. The fume thus inclosed in the chamber, when viewed through the windows, appeared as a very dense fog or mist. Left to itself, it took many hours to deposit. But as soon as the electric machine was set to work, the same action took place as with the magnesia in the bell-jar. Through the windows could be observed the same whirling movement around the discharge points, and in a few seconds the fog was seen changing into little flakes, like snow-flakes, which rapidly flew to the sides of the chamber, and were there deposited till in an incredibly short time the fume had entirely disappeared from the atmosphere of the chamber, which was as clear as before the fume was let into it. Further experiments were then tried as to the action of the electric discharge upon the fume in rapid motion as it is in the flues of the works. The damper in the main flue being closed, the whole of the pressure of furnace gases was turned through the experimental flue and allowed to stream out into the air. Then the electric machine was worked as before. No effect could be seen through the windows, because the rapid current swept the fume onwards too fast to allow of any change being observed at that point. But at the outlet into the atmosphere, a few seconds after the discharge of electricity commenced, the effect was again very striking, the issuing fume again changing from fog into flakes. A glass plate, held in the current before the discharge from the machine began, was only coated, after considerable time, with a thin film. A similar plate, held in the current during the working of the machine, was instantly coated over with flakes and large separate specks of fume. So much was the fume agglomerated by its passage past the discharging points, that on some occasions in perfectly calm weather some of it would fall to the ground immediately on leaving the exit opening of the flue. In short, the series of experiments proved that what took place under the bell-jar took place equally in the flue of a smelting works, with all the attendant circumstances of heat, moisture and acid vapors.

The trials of various arrangements of discharge points seemed to show that, within certain limits prescribed by the power of the machine in use, the more points employed the better was the result, the points being spread as uniformly as possible over the cross section of the flue through which the fumes are passing.

On the strength of the satisfactory results above stated, Mr. Walker decided upon taking measures to apply this new process of fume condensation on a full working scale at the Bagillt Works. The necessary plant is now in course of erection, and nearly completed. The electric machines used will be on the Wimshurst system, with discs of five feet diameter. Two such machines have been constructed specially for the purpose by Mr. F. J. Cribb, engineer, of Chester. They will be driven by a small steam engine, the whole plant being placed in a small building close to the main flue of the works, through which pass all the gases and "fume" from nineteen furnaces.

Mr. Walker proposes to extend the process in England and most European countries, and in the United States. It is intended to apply it to other branches of metallurgy besides lead-smelting, as for instance, the condensation of zinc oxide in the manufacture of zinc-white, and the condensation of arsenic. But its principal field of usefulness will doubtless be in lead works, where, so far, all the proposed systems of condensers have either failed outright or proved so costly to erect and to work that the very imperfect results obtained did not render it worth while to continue their use.

The outlay for the requisite machines, etc., will be a very moderate sum, and the cost of running the apparatus, even for large works, will be limited to the wages of one man per twelve hours, and fuel for a boiler to develop the insignificant power required to drive the Wimshurst machines. There will be little chance of anything getting out of order, and, in case a temporary break-down of any kind takes place, the work of the furnaces will be in no way interfered with. This is, perhaps, the greatest recommendation of this process in the eyes of managers of works. Any one who has run a works, the draft in which depended on mechanical arrangements, as is the case where fume is to be condensed by sucking or forcing through water, knows what a constant succession of break-downs and stoppages has to be encountered. Mr. Walker's process causes, of course, no interruption of the proper draft in the flues under any circumstances. Fume, which is now carried forward through the longest flues and escapes from the chimney, will be rendered so much denser by the action of the electric discharge that it will not be carried anything like so far by the draft, and will rapidly deposit itself. Thus, works which have now considerable flues may look forward to obtaining a greatly increased yield of condensed fume, while others, which have not as yet considered it worth while to erect flues for the partial condensation to be obtained by their use, will probably find it advantageous to do so, when by so simple a process as the one in question they can obtain from a moderate length of flue a greater yield than could otherwise be looked for from a very great length.

When Professor Lodge was carrying on his experiments on "dust" from a purely scientific point of view, it is not likely that he had any idea how soon his results would become of practical commercial value; and the speedy turning to technical utility of these experiments, owing to the sharp-sightedness of Mr. Walker, is but one more of the many instances demonstrating the unexpected and often surprising manner in which "pure science" of one day may be very valuable "applied science" of the next. — *London Engineering.*

—— The Consolidated Electric Light Company, of Maine, is arranging to open and operate the central lighting station of the American system at Old Orchard Beach. A formal transfer by the American Company will be made to the Consolidated, so that hereafter it will be operated by that company. The station has a capacity of 100 arc lights.

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A WEEKLY JOURNAL OF
ELECTRIC LIGHT TELEPHONE TELEGRAPH AND SCIENTIFIC PROGRESS.

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We invite correspondence from Electricians, Inventors and the Telegraph and Telephone fraternity and those engaged in Electric Lighting on matters pertaining to electrical and scientific subjects, and all facts of special interest in connection therewith.

We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

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Mr. C. C. Haskins, 118 LaSalle Street, Chicago, Ill. will represent the REVIEW in the West.

Messrs. Wm. Dawson & Sons, 121 Cannon Street, London, England, are our representatives for Great Britain.

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CONTENTS.

	PAGE
Fritz's Electric Light Engines	1
Tones and Vibrations	1
Trouve's Jewelry	2
Electricity in the Navy	2
The Electrical Transmission of Power	2
A Telpher Line	2
The Wiswell Ore Pulverizer	3
A New Application of Electricity	3
Editorial Notes	4
The Baltimoreans Try an Electric Motor at Midnight	4
The Experiments at Creil	4
Telegraph Wires Beneath the Surface	4
General Western News	4
The Cleveland Convention	5
Telephonic News	6
Meeting of the Central New York Company	6
The General Telephone Co. of Paris	7
The Western Electric Bell	7
Telegraphic News	7
Electrical and Scientific	8
The Absolute Value of the Siemens Mercury Unit	8
Western Union Figures	9
Electric Light News	9
Electrical Patents	10

The Brush-Swan Electric Light Company, of this city, have removed their office from 853 Broadway to more commodious quarters at 204, 206, 208 and 210 Elizabeth street, where they have fitted up an elegant display of electrical light apparatus. They have also in operation here one of the largest plants in the country.

At a meeting of the Tropical Telephone Company directors in Boston, it was voted to pay dividend No. 2 of 10c. per share (1 per cent. on par) July 15 to stock of July 1. The financial statement showed :

Cash in bank	$14,692	85
Cash due from sub-companies and others	17,888	00
Quick assets	$32,580	00
Less accounts payable (entire debt)	5,000	00
Available surplus (75c. per share).	$27,580	00

The Daft motor was tried last week in Baltimore suburbs, on the tracks of the Union Passenger Railway Company, between Huntingdon Avenue and Woodbury, and it is with no little pleasure that we record the fact that the motor ran off the tracks only once, and that the "distinguished guests" who took part in the trial are alive and well.

When the signal was given, the motor moved silently and smoothly up the track, and the distinguished gentlemen aboard were lost in admiration. Whilst they were dwelling upon the advantages of electrical motors of the Daft variety, there was a sudden thump underneath, the truck took on the movement of a wheelbarrow, and the distinguished guests saw with astonishment that the motor had left the rails, and was exhibiting a very decided inclination to climb over a stone wall at one side of the road. This was prevented, and the motor, not being able to find the track in the darkness, the guests were asked to try their luck, and at once got down on hands and knees and crawled over the road, like crabs when the tide is out. The track found, the company resolved themselves into hydraulic jacks, and boosted with a will until once more the motor rested upon the rails.

Instead of gratitude for their providential escape from the surrounding ditches, in which their predecessors at the Daft motor trial at Saratoga were not so fortunate, they evinced a distaste for their task, and an inclination to profanity truly reprehensible.

THE MANAGEMENT OF THE ERIE.

Many of the stockholders in the Erie Telephone Company are considerably exercised over the suit brought by their President, James W. Bennett, and Sherman, one of their directors, against the Lowell Syndicate. The price of Erie stock has received a black eye in consequence of these suits, which it seems hard to recover from, while New England and other telephone stocks have had a handsome advance. Erie remains nominally unchanged, and in order to make any showing in their suits, President Bennett and Director Sherman must show that their company owns a poor property, and can earn little or nothing on its stock, and this is in direct contradiction of their annual report published only a few weeks ago. That the Erie Company has valuable territory capable of earning good dividends on its present stock, there can be no doubt, but in order to do this a strong and harmonious management is necessary, and before stockholders can hope to see an advance in the price of their holdings, something must be done to awaken confidence in the men now handling the company's affairs.

We had hoped the new management would devote itself to the best interests of the Erie stockholders, and by harmony regain the confidence which they had helped to destroy; but with these suits pending shareholders can see but little hope of the long looked for rise in their shares, and the cry for another change will soon be so loud as to awaken some people to the fact that there is something to do which has not yet been done.

THE EXPERIMENTS AT CREIL.

No authorized explanation has yet been given, says *Bulletin des Telephones*, of the want of success of M. Marcel Deprez, in transmitting electrical energy to a great distance. It is said by some that this unfortunate condition comes from a defect in the dynamos, from incomplete insulation of the wires, and the like. But there be those—good authorities, too—who insist that the fault lies not in this or that detail, but in the principle itself, and that M. Deprez will never accomplish his object by means of the system that he has adopted. What have seemed the principal bar and obstacle to success by his system are what are known as the Foucault currents, or, in other words, induced currents which are produced in the iron of the dynamos.

It is not the first time we have heard of the Foucault currents, says our contemporary, and before M. Deprez began his experiments in the machine shop of the Chemin de Fer du Nord, in Paris, for the transmission of electrical energy, a distinguished electrician, Dr. Froelich, had described the obstacle which they oppose to the success of such projects. In April and May, 1881—more than four years ago—this savant published, in the *Elektrotechnische Zeitschrift*, a remarkable essay upon dynamo-electric machines and the transmission of electrical energy. In comparing the theoretical formulæ with the results as observed, he was struck by a defect of concordance which he explained by the action of the Foucault currents. The principal cause of currents, said he, is to be found in the action which the magnetism of the electro-magnet exercises upon the iron core of the ring; following the rotation, the currents must establish themselves in this iron in the same manner as in copper mines.

In the primary machine or generator, the induced currents enfeeble the electromotive force and augment the absorbed energy. In the secondary machine or receptrice, the induced currents reinforce the electromotive force and diminish the energy produced.

In the numerous experiments which have been conducted to a conclusion, the work accomplished was, in reality, always less, and, on the other hand, the electromotive force of the secondary machine greater than would be indicated by the theory upon which these machines are constructed.

Thus, Mr. Froelich puts in evidence a fact which merits fixed attention. The phenomena found in the generation of these Foucault currents have not yet been elucidated, and the very first trial these machines at Creil were subjected to proves that there yet remains that which has not yet been explained, even in those theories which heretofore have been regarded as most perfect.

In the earlier experiments of Deprez, at Munich and the machine shops of the Chemin de Fer du Nord, he had not a surprise of this kind; he operated upon machines comparatively small, and because he employed the Gramme dynamo, in which it was only necessary to rearrange a few trifling details. With new types of machines it was necessary to begin again his studies of the causes which had led to the failure of his predecessors, and prevented them from obtaining what he himself is seeking. If there is no mistake in the strictures of the scientific world on this work of M. Deprez, then, indeed, we are doomed to a bitter disappointment, for we had hoped—and, indeed, the preliminary work of Deprez gave reason for the belief—that he was on the right track in solving that most important of all problems in electrical science, viz., the transmission of electrical energy to a distance by electricity. But Deprez has assuredly done much for science in showing how five and ten horse-power can be transmitted to a distance of nearly ten miles.

TELEGRAPH WIRES BENEATH THE SURFACE.

Mr. William B. Somerville, the press agent of the Western Union Telegraph Company, in speaking of the Daly bill ordering all telegraph wires underground, says:

"We are disposed to help the commission in every possible way, and hope that able and honest men may be appointed. Without being able to speak for the officers of the company, I do not think that any plan has yet been suggested by which underground wires can be made to work properly on long circuits. We run wires from our main operating room to the North River under ground, but the distance to the river is short and the wires are not on very long circuits, such as to Buffalo On the important Western and Northern circuits there will be serious trouble if they have to be buried. But if the commission can suggest some practical way of doing the work we shall be grateful. The public may not be so well pleased, because a great many small offices will have to be discontinued owing to the expense of carrying wires underground. Now we have scores of offices which are merely kept open for the accommodation of the public, the receipts not more than equaling the expenses. We could not go to the expense of running underground wires to these offices.

"The pneumatic tubes by which boxes of dispatches and letters are sent from the Dey Street building to Twenty-third Street have been working very satisfactorily, and the public will soon be able to buy envelopes by which to send letters between the down-town and Twenty-third Street districts inside of five minutes. The system works so well that it is to be extended further up-town. But no wires along Broadway have been taken down in consequence of the success of the tube; we needed them all, and the public is getting better service since we have been able to use them.

"I understand that legal experts doubt the constitutionality of the original bill compelling us to put the wires underground. We put up the poles with the permission of the State, and have paid taxes on them for years. It is, of course, a question involving the life of many of the telephone and other companies which cannot go to the expense of putting an underground cable in every street. People have come to look upon the district messenger service as indispensable, but are they going to submit to having the streets torn up in order to get it? It may be an excellent thing to have the wires underground if the service can be performed; but, aside from any question of injustice to the telegraph or telephone companies, the business community will not agree to any system injuriously affecting the rapidity and certainty of dispatches."

GENERAL WESTERN NEWS.

The bucket shop and quotation war still maintain respectable proportions. Back fire in the shape of a bill presented to the legislature, which had for purpose the annulling of the Board of Trade's charter, and the New York suit against the Western Union, which placed President Green and Secretary Brewer in the predicament of giving bonds for the carrying out of existing contracts, or doing worse, are thought to be "scare cats," which brought about the reconciliation between the open and closed boards of trade, whereby quotations are to be furnished as before. But the bucket shops—there is the rub. These have no rights which a regular boarder is bound to respect. These rats in the meal tub have been hunted, and hole after hole stopped, and yet, up to date, they do get, and they do use, the quotations.

Two of the rat holes through which the enemy has been abstracting information surreptitiously, have been plugged within a few days.

The first one of these consisted of signals from the Board of Trade to the outside recipient, who had a convenient peek-hole punctured through a window curtain. The signals were simply movements of the right or left hand, to the face on either side. An eighth of a cent, up or down, was thus readily given, and received by the initiated.

It is an old axiom that no one man is the intellectual superior of all the rest of the world.

The fact having become patent that the leak was at the fountain head, the law of self-defence naturally made every member, to some extent, a self-constituted detective, and where all are watchers all are watched.

The peculiar and oft-repeated motions of an individual attracted the attention of a member, who soon convinced himself, and immediately confronted the suspect with proof. By this time the gentleman at the peep-hole in the curtain saw that it was time for him to retreat—a movement which was executed with sufficient expedition and circumspection to be successful. But there was rejoicing in the camp of the faithful over the capture and conversion of the erring party, who purposes hereafter doing only legitimate business in a legitimate way. This was on the east side of the house.

Only a day or two subsequently, another case was unearthed in a quite similar man-

ner. The accused party immediately disappeared from the floor, and was subsequently found in a private office opposite the west window of the Board, where a couple of telephone wires have been lately placed. Here the evidences were put that this was another "fence" for the reception of stolen quotations.

In view of the recent decision in New York, and almost innumerable precedents, where the case has turned upon the point of discrimination in favor of one class of patrons, it certainly looks a little doubtful if the quotations are not really for the benefit of any one who is willing to pay the market price for them, like groceries or dry goods. If a railroad company cannot refuse to carry a paying passenger who does not violate the rules of the road or of society, or a merchant refuse to sell goods to a cash customer, the same rule would seem to apply in any other branch of trade. However, being neither a lawyer nor prophet, nor the son of either, this opinion may not have any value, however cheap it may be.

The present State legislature of Illinois has been having some fearful struggles, and has been in a sort of political *delirium tremens* condition from the commencement of the session. The speaker and house have been unable to "consist" from the first. This culminated, after much mud throwing, in accusations of bribery and corruption, and eventually the formation of a committee of investigation relative to blackmailing attempts on the part of somebody.

This committee had inquiries to make into ways, means and methods, relative to an important bill endorsing a very large claim on account of the Illinois canal. A bill to regulate fraudulent butter manufacture and sale, and finally the telegraph bill, which for information is given below in full:

A Bill for an Act Providing for Licensing Corporations, Companies or Individuals Operating Telegraph Lines.

SECTION 1. Be it enacted, by the people of the State of Illinois, represented in general assembly, that each and every person, company, or corporation, whether incorporated, organized, or residing in this State, or outside this State, operating a telegraph line in this State, shall make an annual report to the auditor of public accounts, on or before the 10th day of January, 1886, and each year thereafter, which report shall state: First. The name and locality of the person, company, or corporation; second, the number of miles of telegraph operated by said person, company or corporation in this State, and the location of its lines therein; third, the amount of gross receipts from all sources of their business received within the State for the year ending the 31st day of December preceeding such report. This report shall be verified by the oath of the proper person, or officer, as to its truth.

SEC. 2. It shall not be lawful after the 10th day of January, 1886, for any person, company, or corporation to transact the business of telegraphing or sending messages by telegraph for a compensation, without making the report as herein required and procuring from the auditor a certificate of authority or license. And it shall be a condition precedent to the issuing or the renewal of the annual certificate or license by the auditor, that the person, company, or corporation making the statement shall pay into the State treasury the specific sum of 3 per cent. on the gross amount received by said person, company, or corporation within this State, for the year, included in the report provided for in Section 1 of this Act, which said specific sum may be recovered in any court of competent jurisdiction, at the suit of this State. It shall be the duty of the State Treasurer to give his receipt in duplicate for all moneys paid into the State Treasury under the provisions of this act, and the Auditor of Public Accounts, on the presentation of such receipt from the Treasurer, shall issue as many copies of the annual certificate or license as may be desired by said company, not exceeding one for each agent or place of business in this State.

SEC. 3. Any person, company, or corporation violating the provisions of this Act shall, upon conviction thereof in any court of competent jurisdiction, be fined in any sum not less than $10 nor more than $100 for each and every act, at the discretion of the court. Violations of the provisions of this Act may be prosecuted in the name of the people of the State of Illinois, and it shall be the duty of the State's attorney in each county in this State to prosecute for any violations of the provisions of this Act Such prosecutions may be carried on either by indictment, information filed by the State's attorney, or by an action of debt for the penalties incurred.

SEC. 4. Any telegraph corporation, company, or individual complying with the requirements of this Act, and receiving the certificate or license from the auditor, as provided in this Act, shall be permitted to do business in any part of this State, and the taxes therein imposed shall be in lieu of all other taxes on telegraph interests, and none others shall be imposed on such interests except on real estate, and the money received therefrom shall be placed in the general revenue fund for State purposes.

Speaker Haines and Representative Baker were examined before the Committee relative to this, among other proposed bills in which it had been assumed there had been crooked work charged. The interesting part of the testimony to the readers of the REVIEW, was an affidavit by Superintendent F. W. Tubbs, of the Western Union, here.

In this document the Superintendent states that Representative J. H. Baker, of Moultrie County, proposed to defeat the bill, to accomplish which he demanded $500 for himself, and $2,000 for other members whom he claimed to represent. Mr. Tubbs avers that this offer was made in February, at the capitol. Baker swears a point blank denial of the whole thing. The matter stands now in the position of diametrically opposed statements, which collateral or circumstantial evidence must settle the exactness of.

In addition to this, according to correspondents, "there is a well authenticated story afloat that some members went direct to the Western Union office in Chicago some weeks ago, and demanded cash down for voting against the Telegraph bill." We shall probably know more of this before frost, for there is certainly a cold day coming for somebody.

The second annual Convention of the American Train Dispatchers' Association was held at Denver, Colorado, commencing 16th inst. An address of welcome was delivered by Mayor Bates. 250 delegates were present at roll call, and 300 applicants were admitted to membership.

The Association of Railway Telegraph Superintendents held their annual meeting at Cleveland, O., commencing on the 17th instant. Officers were elected as follows: C. W. Harmon, of St. Louis, Mo., President; George L. Lang, of Boston, Mass., Vice-President; P. W. Drew, of Chicago, Ill., Secretary and Treasurer.

Two systems of telegraphic communication with moving trains by inductive action were explained and discussed during the forenoon session of Wednesday. In the afternoon the talk was all about "nothing," or, in other words, the Morse cypher, and resolutions adopted recommends its substitution by another symbol.

This looks like cruelty. In the course of a message there are but two places where a tired plug operator can find rest—when making a figure six, where he makes dots till he can't rest, and when he prolongs a cypher sufficiently to bite his tobacco and read the rest of the message. A move of this sort is oppressive in its character, and should be frowned upon by all plugs. In their peculiar tongue, we may imagine them yelling over the wires, "Op hugas gi ti pell!"

The representatives to the called convention of telephone people at Boston have returned, but the outside anxious multitude is denied all information of what was accomplished. Central Union being a regularly listed stock now, transactions are more generally known than before. Nearly every day, for the past two or three weeks, demands have been made, and there have been several transactions in a moderate way. Offers of from 53 to 57½ have been constantly repeated, but no sales. Some transactions have been made at 58 to 58½, but holders in general want higher prices. In fact, only unfortunates who are compelled to raise money are willing to sacrifice a stock which, bought at 60 or under, is paying 10 to 12 per cent. per annum. When other stocks get up to their maximum, as they are expected to ere long, Central Union and other telephone stocks will hold their own as before.

The general supposition has always been that the feline race, as a rule, is possessed of very sensitive nervous organizations. A gentleman of a philosophical turn of mind, who is connected with a prominent electrical concern here, tells of a test which either contradicts this theory or that other theory which assumes that a delicate nervous organization is most susceptible to electric currents.

With a battery of something like 50 cells of silver chloride, he connected a dish of milk in circuit with a metal slate on the floor, leaving pussy to close the contact through the metallic connection. The current was sufficiently strong to be readily felt when standing upon the metallic plate and dipping the finger into the milk.

Pussy was called to dinner, and, after a few dips and preliminary shakes of the head, made away with the milk and licked her chops for more, but the current didn't make away with the cat.

Why, in the name of common sense, doesn't some one in authority arrange a lightning arrester for the Washington Monument? After some forty years—more or less—of bother and worry in getting it placed, are we to lose the whole structure for want of proper protection?

And when it is done, let it be well done. Give it rods of sufficient carrying power, at least four—one for each corner, with occasional cross connections—and all these connected to the iron-work, the whole carried low enough to form a thoroughly reliable ground connection, the system terminating in a vertical copper sheet. The aluminum tip at the top of the structure is a beautiful design architecturally, but, without connection to ground, its "beauty may be its ruin."

These suggestions may be behind time, perhaps, but if not applicable in this case they may be wrapped up and laid on the shelf for any coming opportunity, and they will not lie there long wanting a case for application.

Blunders in lightning-rod philosophy are like the poor—we have them with us always; yet, out of the multitude of lightning-rod fellows who have besieged the officials in the interest of saving the long and wearily-grown monument, there ought to be some proper selection of system adopted before the next thunderbolt to save the nation from another half-century of agony in rebuilding it.

Chicago.

THE CLEVELAND CONVENTION.

(Special Correspondence to ELECTRICAL REVIEW.)

CLEVELAND, Ohio, June 18, 1885.

The annual meeting of the Association of Railroad Telegraph Superintendents was held in this city yesterday. The gathering was called to order at 10 o'clock in the morning in the Weddell House parlors by the president, C. Shelden, of the Baltimore & Ohio Railroad. Present were the following members: C. Selden, Baltimore & Ohio, Baltimore; P. W. Drew, Chicago & Eastern Illinois, Chicago; W. R. Morley, Chicago & Alton, Bloomington; H. C. Hope, Chicago, St. Paul, Minneapolis & Omaha, St. Paul; O. C. Greene, Northern Pacific, St. Paul; G. L. Lang, New York & New England, Boston; G. W. Hammond, Missouri Pacific; St. Louis; C. S. Jones, Illinois Central, Chicago; N. B. Patterson, Chicago & Western Indiana, Chicago; A. R. Swift, Chicago, Rock Island & Pacific, Chicago; H. C. Sprague, Kansas City, Fort Scott & Gulf, Kansas City; J. H. Hill, Southern Kansas, Florence, Kas.; N. C. Griswold, Baltimore & Ohio, Pittsburgh; G. C. Kinsman, Wabash, Decatur, Ill.; H. F. Houghton, Wabash, Butler, Ind.; G. P. Williams, New York, Chicago & St. Louis, Cleveland; J. B. Shaw, New York, Pennsylvania & Ohio, Jamestown; T. J. Higgins, Bee Line, Cleveland; J. S. Stevens, Wabash, Peru, Ind.; J. W. Fortune, Chicago & Grand Trunk, Detroit.

An invitation was first extended to Lucius J. Phelps and J. Barton Key, representing the Phelps Induction Telegraph Company, of New York, and also to Lieutenant F. W. Tappan, representing the Railway Telegraph and Telephone Company, of New York, to be present during the entire meeting.

The election of officers for the ensuing year was the next business before the Association, which resulted as follows: President, C. W. Hammond, of the Missouri Pacific Railroad, St. Louis; Vice-President, Geo. L. Lang, of the New York & New England Railroad, Boston; Secretary and Treasurer, P. W. Drew, of the Chicago & Eastern Illinois, Chicago.

Mr. Phelps, superintendent of the Phelps Induction Telegraph Company, was then invited to present to the association his system of telegraphing to and from moving trains, which he did in a very detailed and comprehensive manner, occupying almost the entire morning session. Cuts and diagrams were put in the hands of each of the members present, in order that they might follow the description more intelligently, and Mr. Phelps was listened to for nearly two hours with deep interest. After describing the mechanical and electrical features of the invention, which have heretofore fully appeared in the columns of your paper, Mr. Phelps cited numerous accidents, all of which were fresh in the minds of those present, which could, and in all probability would, have been prevented had this system been in use. He also dwelt for some time upon the numerous and varied uses to which the system could be put, its advantages as a money-saving, time-saving, and life-saving appliance. He said that his company did not offer the system to railroads as a matter of luxury, but as a matter of economy and necessity. As all trains are moved by telegraph, certainly the simplest, safest, and quickest way to reach the train is by direct communication, just as a straight line is the shortest distance between two points. As to the practicability of the system, he said it was no longer a matter of theory or speculation, but an absolutely demonstrated fact; that it had been working successfully for several months on the N. Y., N. H. & H. R. railroad, and closed by extending a very urgent invitation to all present to come and personally inspect the system which is now in daily operation.

Lieutenant F. W. Tappan was then asked to explain the system of railway intercommunication which he represented. Mr. Tappan said that in their system a sheet of copper foil upon canvas was fastened to the side of the car, and that the communication was had between the copper foil and the wires upon poles already in use for other purposes. Stopping there, he said he was not at liberty to go into detail, as the system had not yet been perfected, and patents had not been secured.

THE AFTERNOON SESSION

was mostly occupied by a discussion of the "Phelps Induction Telegraph," and the almost innumerable advantages which it afforded railroads.

A resolution recommending a change in the Morse symbol now used to represent the figure 0 was adopted, the new symbol being - - — —, instead of the long dash heretofore used. The change was deemed advisable, because 0, as it has been heretofore represented, is likely to be confounded with L. Several instances where one of these characters was mistaken for the other were mentioned, the only difference being a slight difference in length. One of the members stated that he knew of a case where 2 L L (Lackawanna Line) cars were ordered from one end of the road to the other; the receiving operator interpreted the message as meaning 200 cars, and without delay that number was started on a journey of a hundred miles.

The meeting then adjourned till 10 o'clock the next morning.

It now looks as though the Brush-Swan Electric Light Company, reorganized under the management of such able men as Colonel Strong, Mr. Powell, and Mr. Whitney, would soon be heard from at the front.

Telephonic News

*** At the recent telephone conference several of the young telephone officials from the West proved themselves to be orators of no mean ability.

*** The use of the telephone in Mexico is daily increasing, and is making its way on its merits without invoking the employment of extraordinary means or inducements.

*** The Southern Bell Telephone Company, of New York, controlling the Southern States, has declared a quarterly dividend of 2 per cent., payable July 1. This is an increase from 1½ per cent. paid in January and April.

*** In Philadelphia last week, the jury rendered a verdict for the plaintiff for $150.25 in the United States Circuit Court in the suit of the White Quail Mining and Smelting Company against the Western Union Telegraph Company, as damages for negligence in the delivery of a telegram in 1882.

*** The promised reduction of rentals in instruments by the American Bell Telephone Company is, we understand, about as follows: For exchanges where the rate received is $30 and less, the charge to the licensees will be about $6 per set; in cases where the rate received is $36 and less, $8; $40 and less, $10; $42 and less, $12.

*** The utility of the telephone is now being recognized in the military offices of England, where it has to a great extent supplanted the simple A B C telegraph. For some time past the Royal Engineer Department has been busily engaged in fitting Gower-Bell instruments, and already communication by telephone has been established between the offices of the Assistant Adjutant-General, the Royal Engineers, the Transport Office, and the Commissariat Supply and Ordnance Store Depots.

*** As a result of the conference of the parent and licensed telephone companies, the former has agreed to make a concession in the matter of rental in the outlying districts, no change being made in thickly settled localities. This will help the weak companies, and, while the concession, in the aggregate, amounts to considerable, the parent company will recover a part of the loss, in the form of dividends on franchise stock, and rental on instruments that would not have been used had the small exchanges been closed.

*** With respect to an improved form of telephone receiver recently patented by Messrs. G. H. Bassano, A. E. Slater, and F. T. Hollins, of Derby, Eng., the two former carrying on business as telegraph instrument manufacturers at Derby, it is stated, that it gives excellent results, being both sufficiently loud and very distinct in its articulation. The very many patents taken out for telephone receivers are, as a rule, conspicuous only for their want of novelty. This receiver has several points in which it differs from others, and is generally a novel and most effective arrangement, but it being *sub judice*, it is premature to express any opinion as to its bearing on existing patents.

*** Did it ever occur to telephone experts who speak of a constant current of electricity passing over the wire that, in the nature of things, it cannot be continuous or constant. When the diaphragm recedes the current is sent in one direction; when it approaches, in another; consequently there must be a point where the diaphragm reverses its movement that it is motionless, otherwise we would have it accomplish the somewhat difficult feat—outside of politics—of going in opposite directions at the same instant. Therefore, it would seem that telephoning by electricity consists in using an electric current which is made to pass first in one direction and then in the opposite—a series of "breaks" or disconnected currents.

*** The *Financial News*, of London, has published a list of rates charged by telephone companies in different cities of Great Britain. There is a wide variation in the charges, which manifestly cannot be due simply to differences in the cost of the plant or in the administration. Dundee has the lowest rate, that of £5; Sheffield and others, £10; Edinburgh, £15 15s.; and Liverpool and Manchester are taxed at £20. As the writer says, "It is the squeezability of their customers rather than the cost of supplying wires and instruments which the companies have chiefly taken account of."

*** Mayor Low, of Brooklyn, is daily receiving applications for appointment as commissioner under the act passed June 13, providing for placing electrical conductors underground. Sometimes the applicant appears in person, sometimes his friends appear for him, and with persuasion, argument, and fact put his case in the hands of the Mayor. They all find an attentive listener, but it is safe to say no pledge has yet been given or promise made, The Mayor merely places each application on file or makes a memorandum for future reference. Up to this morning the applications received numbered between 20 and 30.

The appointment will be made by July 3. The act requires three commissioners for each city; but, according to a certified copy which has just been received, those who are appointed for this city will be paid $3,000, not $5,000 a year. This change was made at the request of Mayor Low, who also secured the insertion of the following clause:

"The Board of Commissioners, in preparing their plans, must so devise them that the subway may be used by any such city for the electric wires or conductors operated by its Police, Fire, or other departments without expense, except the expense of the wires and conductors; but no such city shall be compelled to place any such wires or conductors underground until the money has been specifically raised therefor by the proper authorities, and until that time any such city may continue to use and extend any such wires in the same manner as though this act and the act referred to in the second section of this act, had not been passed."

The commissioners are given ample power to decide in which streets the wires and cables must be placed under ground, and on which they may remain overhead. They are given full control, a fact of which Mayor Low seems to have a lively appreciation, as he thinks of the appointments he will be shortly called upon to make. It is quite possible, however, that the courts and the companies may have something to say in this matter, and even the dear public may yet have cause to regret having sent such a person as this man Daly to the Legislature. The public will look at this underground scheme in a different light, perhaps, after they have been deprived of the use of the telephone, telegraph, and electric light for a short season.

*** The International Bell Telephone Company, operating in the principal countries of continental Europe, has declared its first dividend, 2½ per cent., payable July 1 to stock of July 20. The Tropical was the first of the companies operating in foreign countries to declare a dividend. The International now follows the example. In connection with the declaration of a dividend, the International Bell Company presents a financial statement which shows that, of a capital of 17,000 shares, 3,139 are held in trust to meet $313,000 convertible 6s, and that the debt consists of the above bonds and $238,000 inconvertible 6s. The company has 1,052 paying subscribers in Christiana and Drammen, Norway; 2,531 in Russia, and exchanges of nominal value in Italy, besides stock in subcompanies in Holland, Belgium, etc., of considerable value. The gross receipts in Europe in 1884 were 697,777 francs, and net receipts, 624,649.89 francs, equal to $120,124. New York and interest expenses reduced this amount to $83,575.14. The business so far this year encourages the president to expect 5 per cent. dividends in 1885. A beginning has been made by paying 2½ per cent., as above.

Annual Meeting of the Central New York Company—Reports of President, Manager and Treasurer—Officers.

The annual meeting of the stockholders of the Central New York Telephone and Telegraph Company was held last Friday.

The president, Robert S. Williams, presented his annual report for the year ending April 30, 1885. After alluding to the reports of the manager and treasurer, he says:

"Considering certain adverse circumstances with which we have had to contend, the reports are encouraging; yet, so far as dividends on our investment are concerned, the result has been disappointing. The rates charged our subscribers are, on the whole, less than those made for like service and facilities in any company of which we know. The cost of operating and maintenance is steadily increasing. Some of our exchanges have been run at a positive loss. These matters are receiving the careful attention of the directors, who, however, prefer to await the results of further experience before committing the company positively to any different policy.

"On the 1st of March, 1885, the American Bell Telephone Company became entitled to participate to the extent of their holding of stock, issued to them for our franchise, in all dividends which might thereafter be made. It therefore became necessary to provide for the payment of the outstanding debt of the company, and it was deemed advisable to do this without further increasing our capital stock or making an issue of bonds. An agreement was made with the parent company, involving concessions on the part of each to waive all dividends for one year from March 1, 1885, or until all the indebtedness was paid off, including the three scrip dividends made the past year. Dividends heretofore made have been declared on 65 per cent. only of our capital, but hereafter they will be made on the whole capital stock—a virtual increase of our expenses to that extent.

"The general business depression has undoubtedly curtailed our receipts, while we have suffered specially from the persistent opposition of the Baxter Company, who, operating for some months in the City of Utica an exchange at rates greatly below those charged by us, drew away our subscribers, prevented an accession of new customers, and gave the public the impression that the rates charged by us were exorbitant. Aside from the question of royalty, careful statistics compiled by us show that in the rates fixed by the opposition no proper allowance was made for the cost of operation and maintenance; while the fact that our net revenue from all sources gave simply 5.57 per cent. on our capital disposes of the idea, carefully nursed in the public mind, of the extravagant profits we were making. We have also felt in the conduct of our business the general opposition made to the monopoly of the telephone enjoyed by the parent company. We, being most accessible, have been subjected to whatever form of opposition this dislike might take. We, of course, are helpless so long as the patent is maintained in the courts. The royalty charged must be paid, but it has been an aggravation to us that no credit has been given us that in the low rates fixed by us, compared with those fixed by other local companies working under similar circumstances, we have, in fact, paid out of our own earnings the larger part of this royalty, instead of throwing it upon our customers by increasing rates.

"Our net earnings have been largely used in the construction of toll lines, which have greatly added to the value of the telephone in the business houses of patrons, and which lines must eventually add materially to our revenue.

"With the extinguishment of our debt, the natural increase of business, economical management of our affairs and freedom from adverse influences, reasonable but not large dividends may be hoped for at no distant day."

GENERAL MANAGER'S REPORT.

"April 30, 1884, we had exchanges in operation, 14; subscribers to same, 1,258; total stations, 157. April 30, 1885, we have in operation: exchanges, 14; subscribers to same, 1,281; total stations, 247; a net gain of 23 subscribers. During the year the business has suffered to some extent by the opening of a Baxter exchange in the city of Utica. This has not materially checked the growth of our toll lines. The net gain has been 90 stations, thus indicating that this branch of our business can be depended on to show fair earnings and is worthy of constant attention. Our monthly toll reports confirm this view, as during the present business depression they keep steadily up to the average.

"The number of miles of toll lines owned and operated by your company April 30, 1885, is 1,314, an increase of 526 miles during the year. While the money for the building of these lines was largely secured by the sale of tickets, it was found necessary in many cases to add to the amount thus raised, and this addition was necessarily drawn from our earnings. Experience proves that it has been well expended.

"The principal damage for the past year has been from sleet storms, the exchange at Carthage having been entirely destroyed. Rome suffered very severely from this cause. Watertown and Ogdensburg were also damaged to quite an extent by the same storm. All our plant is in first-class order.

"Acting upon past experience, plans for the building of about 400 miles additional toll lines were perfected early in the spring, and this construction is now actively under way, about 18 new stations having already been opened. Lines still under contract will, when completed, unite all parts of our territory and increase the amount total of toll stations from 241 to 234. * * An exchange with 30 subscribers has been opened at Canton since April 30, 1885, and rates are such that under the new dispensation it cannot fail to pay. The closing of the Baxter exchange in Utica has run up the list of subscribers to a higher figure than ever before reached. In general the future of the business looks more encouraging. C. A. NICHOLSON,
General Manager."

TREASURER'S REPORT.

The secretary and treasurer, F. G. Wood, presented the following report:

EARNINGS.

Exchange	$48,068.96
Toll lines	22,971.59
Extra-territorial	8,538.43
Private lines	1,272.61
Messengers	1,015.20
Miscellaneous	728.38
Total	$82,595.17

EXPENSES.

American Bell Telephone Company for rentals	$21,383.31	
For ex.-territorial commissions	1,063.83	
For telegraph tolls, commissions	140.00	
		$22,587.14
Salaries, taxes, etc.		6,241.04
Operating expenses		20,009.63
Repairs and maintenance		5,046.83
Messengers		860.72
Depreciation		120.19
		$54,865.55
Net earnings		$27,729.62
Surplus, May 1, 1884		3,916.64
		$31,646.26
Scrip dividend, July 15, 1884	$4,875.00	
" " October 15, 1884	4,875.00	
" " January 15, 1885	4,875.00	
Reserved for unearned rentals, franchise and license	6,840.34	
Profit and loss, April 30, 1885	4,860.90	
		$31,646.26

The following officers were re-elected:

Officers—R. S. Williams, president; H. L. Storke, vice-president; F. G. Wood, secretary and treasurer; C. A. Nicholson, general manager; T. P. Nightingale, superintendent.

Directors—James Seymour, Jr.; O. A. Morgan, Henry L. Storke, Charles A. Nicholson, Robert S. Williams, Lewis H. Lawrence, Francis G. Wood.

The time for holding the annual meeting was changed to the second Thursday in February.

*** Bell telephone has delighted its friends by rising to 205. The legislature will be unable to disturb the even flow of prosperity further until next January, and meanwhile stockholders will look for 3 per cent. dividends quarterly.

The General Telephone Company of Paris.

It will be of interest to give some statistics and other information relating to the administration of the General Telephone Company, of Paris. Founded on the 2d of February, 1880, with a capital of 8,500,000 francs, its primary object was to work the Edison and Gower patents. On the 23d of November, 1881, it underwent considerable modification; its capital was increased to 25,000,000 francs, and it acquired several large industrial establishments, amongst others the works of Rattier & Co. and of Digney & Co. Since the date of its establishment, the General Telephone Company has established systems in the following towns: Paris, Lyons, Marseilles, Bordeaux, Nantes, Le Havre, Rouen, Lille, St. Pierre, Oran, and Algiers, whilst others for St. Etienne and St. Chamond are now being arranged. The *reseaux* have been established, under concessions of five years' duration, by the Minister of Posts and Telegraphs, and renewed, so far as Paris is concerned, for a second term of five years. This renewal is attended by a considerable extension of the *reseau*, involving the establishment of connections with the suburbs of Paris, the installation of telephonic stations for public use, and with which 1,500 communications are made weekly, a system of receiving and dispatching telegrams by telephone, etc. The general organization of the service in Paris comprises twelve chief bureaux, forming the centers of ten telephonic arrondissements. As may be supposed, the number of users is greatest in the center of Paris, and the increase of the subscribers has been very rapid from year to year.

In January,	1881,	the total number was	1,200
"	1882,	" "	1,735
"	1883,	" "	2,365
"	1884,	" "	3,046
"	1885,	" "	3,933

The average number of communications made per week has been as follows:

In 1881	60,000
" 1882	86,000
" 1883	116,000
" 1884	154,000
" 1885	170,000

These amounts correspond almost exactly to fifty communications per week for each subscriber. In the following table similar information is given for the different provincial *reseaux*.

Towns.	1884.		1882.	
	Number of Subscribers on the 1st January.	Number of Communications per Week.	Number of Subscribers on the 1st January.	Number of Communications per Week.
Algiers	18	210	22	280
Bordeaux	306	9,311	325	7,617
Le Havre	190	6,261	204	5,421
Lyons	497	23,478	585	40,469
Marseilles	358	17,036	386	16,879
Nantes	97	1,400	98	1,891
Oran	33	350	40	480
Rouen	78	810	103	1,574
St. Pierre les Calais	91	949	110	1,219

NOTE.—The total number of provincial subscribers on the 1st of January, 1884, was 1,668, and on the 1st of January, 1885, it was 1,782. The average number of communications per week in 1884 was 59,809, and in 1885 it was 75,830.

The foregoing figures correspond to an average of thirty-five communications weekly in 1884, and to forty-three per week during the first three months of 1885, this increase being due especially to the development of the system in Lyons, but the average does not equal that reached in Paris. On the 23d of April last the general situation was as follows:

	Subscribers.
Paris	3,792
Algiers	22
Bordeaux	334
Le Havre	210
Lyons	612
Marseilles	393
Nantes	98
Oran	50
Rouen	113
St. Pierre les Calais	105
Total	5,729

Up to the month of April last the weekly average of communications made through the fifty-six public telephonic bureaux was 1,548. The exchange of telegrams by telephone, which has only recently been established, involves a minimum extra charge for each dispatch of 5d., but a saving of about one hour in the time of delivery is insured, which is often a matter of great importance, especially in stock operations. The number of subscribers to this system is as yet only about twenty, and the weekly number of dispatches sent is 120. The foregoing statistics may be supplemented by some figures relating to installations. There are altogether 5,641 lines in France, of which 3,722 are in Paris, where the *reseau* is almost entirely laid underground. The cables containing two, six, or fourteen conductors, covered with sheathing of various colors, are protected by leaden pipes, and are laid in the sewers. In the provinces, on the other hand, the wires are almost wholly fixed overhead. At Bordeaux they are partly underground and partly overhead. The latter were, at first, made of galvanized steel wire 2 mill. in diameter, but these have all been replaced by silicious bronze wires of 1.10 mill. In the *reseau* now being established at St. Etienne, the lines will be formed of several conductor, insulated from each other, and inclosed in the same sheathing. They will be fixed against the façades of the houses by means of hooks.

The Ader instruments are used throughout Paris both for transmitting and receiving.

THE MONOGRAM BOX BELL, MANUFACTURED BY THE WESTERN ELECTRIC COMPANY.

These apparatus are too well known to require description, but special modifications have been introduced in some of them. One such modification secures a direct call between two stations without the intervention of the central bureau, and without interfering with the facilities for communicating with other subscribers. With this device, by pressing a button, the annunciator of the central office falls, without the further station, with which direct communication is established, being interrupted by any bell signal. When the conversation is finished, the central office re-establishes communication between itself and the two stations which are furnished with the special apparatus. By another system it is possible to employ one line for several persons occupying the same building. With this apparatus the central station can signal any one of the four or five stations connected with the single wire without disturbing any of the others, and in the same way each of the subscribers in the building can communicate with the central office without interfering with one another. This system possesses several advantages; it is impossible to overhear any conversation being transmitted, communication cannot be severed, and it is easy to ascertain at any time whether the line is free or in use. In the provinces the instruments used are either the Aders, the Gower, or a modified Edison. Leclanche batteries are universally employed. In Paris, as in the provinces, the commutators at the central offices are fitted with American annunciators and jack knives; in Paris the annunciators are arranged for double, and in the provinces for single wires.

The Société Générale makes all the matériel it employs at their works, Rue des Entrepreneurs, and at Messrs. Digney's works, which, as above stated, they recently acquired. The company also makes telephonic apparatus, and in fact all matériel referring to the application of electricity to the telegraph, the telephone, or to railway working. It is also proprietor of the old Rattier works, at Bezons, which are devoted especially to making conductors and their fittings. The Berthoud-Borel French patents, for encasing conductors in lead, are owned by the company, and worked at the Bezons factory. The cable for the power transmission experiments between Creil and Paris were made at Bezons, and fixed by the Société Générale. Rubber and gutta-percha are converted at the same place, not only for electrical purposes, but into the most miscellaneous forms—cords, sheets, springs, tubes, dresses, belts, carpets, etc.

The Western Electric Bell.

The above cut shows the outside appearance of a new iron box bell made at the New York factory of the Western Electric Company. It is designed to fill the demand for a cheap bell, which is attractive in appearance and at the same time reliable in operation. The dead black color of the box is relieved by the monogram "W. E. C.," in raised letters, either gilded or plain, giving it a general effect the reverse of cheap. The internal mechanism is the simplest that we have seen, consisting of few parts, so constructed that it is practically impossible to get them out of adjustment, and so designed electrically as to require the least battery for the same work of any bell in the market at the present time. The stroke of the bell is adjusted from the outside. We understand that although the manufacturers have not yet put these bells on the market, their customers who have seen the model have testified their approval of its construction by large orders.

* * The statement is made by the *Engineering and Mining Journal* that the contracts for exports of copper already aggregate about 64,000,000 pounds. This presumably refers to the ingots only, and not to the ore, of which 75,425,280 pounds were exported last year, besides about 31,400,000 pounds of copper manufactured in various forms. Assuming that the ore contained copper in proportion to its officially reported value, the net exports last year may have been equivalent to about 61,000,000 pounds of copper, or about 31,700 tons. A report by Henry R. Merton & Co., of London, puts the total production of copper in the world last year at 208,313 tons, of which the United States produced 63,950, Spain and Portugal 43,664, Chili 41,648, Germany 14,782, Aurtralia 13,300 and all other countries 30,969 tons. According to these figures, the production of the United States last year was over thirty per cent. of the aggregate. If the net exports were 31,700 tons there were left for consumption in this country 32,250 tons, a little less than a sixth of the world's entire consumption. But for the decline of ship building here, the proportion would be much larger; in telegraph and telephone wires and supplies, the consumption is probably much greater than in any other country.

... Among the subjects considered by the American Association of Railway Telegraph Superintendents, at the annual meeting, were the management of operators, their duties with respect to handling trains, and the question of service cards. C. W. Hammond, newly-elected president, was then installed. C. Selden, retiring president, was presented with a gold-headed cane by C. S. Jones, on behalf of the association. The association decided to adopt telegraphic characters—two dots and two dashes for a cipher, to distinguish it from the letter L.

TELEGRAPHIC

.... James L. Shaw, a leading telegraph contractor, of Philadelphia, died June 9.

.... The number of messages passing over the lines of the Cuba Submarine Telegraph Company during the month of May was 4,474, estimated to produce £3,700, against 3,339 messages, producing £2,973 in the corresponding month last year.

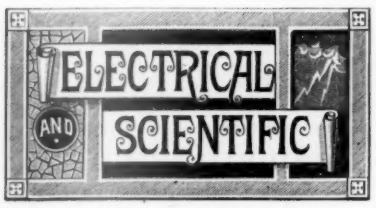
.... In the Common Pleas Court, Cleveland, Campbell C. Brown and Thomas Fleming, of New York, who were recently granted a judgment for $105,000 against the Postal Telegraph and Cable Company by the Supreme Court of New York, made application for a receiver to take charge of the company's lines in Ohio, which have been appraised at $80,000. Judge Barber appointed Albert M. Chandler and Henry M. Rosener, who are also the receivers in New York.

.... According to a contemporary the increase of telegraphic business in Great Britain has been amazing. In 1871 the number of telegrams in the provinces was 5,300,000, and in London 2,900,000; in Scotland about 1,000,000, and in Ireland 606,000. But in 1883–84 the provinces sent 15,000,000, London 12,700,000, Scotland 3,300,000, and Ireland 2,000,000, making a total of 32,000,000, as against the 9,000,000 of 1871. The number was still increasing at the rate of about 2½ per cent. per year.

.... It is estimated that it will cost $7,000,000 to unite London and Paris with pneumatic tubes, the total distance being three hundred miles. It is proposed that two pneumatic tubes be laid, following the line of the Northern Railroad from Paris to Calais, thence across the channel to Dover, and following the line of the South Eastern Railroad to London. Letters could thus be transmitted between the two capitals in one hour. Wagonets like those now used to transport telegrams from Paris are to be used, weighing ten kilograms and capable of carrying five kilograms' weight of mail matter. Twenty pneumatic trains are to be started every hour.

.... In the Court of Common Pleas, New York, Judge Daly signed an order in the suit of Hammond & Dodge against the Gold and Stock Telegraph Company, adjudging the defendant company guilty of contempt, and directing that Norvin Green and A. R. Brewer, president and secretary of said company, be confined in Ludlow street jail until the company obeys the order of injunction issued December 20, 1882, and continued March 3, 1885, by restoring the wires and connecting the indicators in the office of the plaintiffs with the circuit of the Gold and Stock Telegraph Company. Mr. Stephen D. Law was appointed referee to determine the amount of damages due Hammond & Dodge. Up to a late hour, Dr. Green and Mr. Brewer had not been incarcerated.

.... Judge Phelps, in the Circuit Court at Baltimore, last Saturday, appointed ex-Judge George W. Dobbin, Samuel Snowden and Samuel D. Sprigg receivers of the Postal Telegraph and Cable Company, in place of Francis P. Stevens, T. Wallis Blackistone and A. B. Chandler, of New York. Mr. Stevens was appointed by Judge Phelps May 30, on a bill filed by him as counsel for Austin G. Day, of New York, a creditor of the company. Messrs. Blackistone and Chandler were appointed June 3 by Judge Duffy, on a bill filed by the New York receivers of the company. Mr. Blackistone obtained possession of the offices in Baltimore, and Mr. Stevens filed a petition for an attachment for contempt against him for interfering with him as receiver. The petition was dismissed after argument. Of the new receivers, Judge Dobbin has had no connection with the company. His appointment was suggested by Judge Phelps, and assented to by Mr. Blackistone. Mr. Snowden is counsel for Mr. Stevens. Mr. Sprigg is the manager of the Postal Company in Baltimore.



* * The following named gentlemen have been appointed by Mayor Low, of Brooklyn, to act as Commissioners under the new law requiring wires to be placed underground: Rossiter W. Raymond, Prof. Clinton and John Reynolds.

* * Mr. W. C. Smith, superintendent of the fire alarm of New Haven, has applied for a patent on an invention which promises to become very popular among yachtmen. A ship's bell heretofore has been struck by the direction of the officer of the watch. Mr. Smith's invention makes use of electrical appliances connected with the marine clock in the cabin of the yacht and with the ship's bell. The system of wires differs very little from the system of fire-alarm signaling, striking the bell every half-hour with the most mechanical precision.

* * A prize of 1,000 francs has been awarded by the French Society for the Encouragement of Industry to M. Manlies for the discovery of a mode of improving commercial copper. He adds to the molten copper, just before casting, an alloy of seventy-five per cent. copper and twenty-five per cent. manganese, of which, it is stated, there is very cheaply removed a sub-oxide of copper, which is present in the metal treated in ordinary ways, and which lessens its tenacity. It is held by the society that experiments prove that copper prepared by the new process is much superior to the ordinary metal for sheathing ships' bottoms, and for other purposes in which tenacity and durability are desirable.

* * It is certainly not always possible to foresee, when some new invention is made, to what unexpected uses it may be put. Probably, when Balmain invented his now so well-known luminous paint, he did not foresee any special appreciation of it in countries which suffer from earthquakes, but it is stated that the inhabitants of some such regions use it and value it highly. The Philippine Islands and Manilla are specially mentioned as places where the paint is used inside the houses in various ways, so that on an alarm of earthquake during the night the occupants may easily and certainly find the doors, and bolt out into the comparative safety of the open air. It certainly makes an uncomfortable impression on one to think of people having to go to bed prepared for such unpleasant awakening as that caused by an earthquake.

* * M. Eugene Demarcy has communicated a paper to the French Academy of Sciences, in which he shows that there are good grounds for believing that the temperature of the induction spark depends almost entirely on the intensity of the extra current of rupture of the primary or inducing circuit of the coil, and the reduction more or less complete of the spark formed on that rupture by the condensers placed in the inducing circuit at the terminals of the interrupter, as employed by M. Fizeau. Its energy appears to pass into the induced spark, so that in order to have the last as hot as is required with a given bobbin it is necessary to increase the extra current of rupture by making the intensity of the exciting current increase, and attaching to the terminals of the interrupter condensers capable of reducing the spark to convenient value. The remark has a special value in the application of the induction coil to spectroscopic observations. While upon this subject we may mention the curious observations of Mr. Shellford Bidwell to the effect that when a vacuum tube colored by the induction spark is slowly rotated a gray specter or "ghost" of the tube may be observed at an angle of about 40 deg. from it. Mr. Bidwell considers the effect due to a reactionary image in the eye.

* * The number of visitors to the International Inventions Exhibition for the week ending May 30, was 211,633; total since the opening, 491,642.

* * Alexander Hibbard, the young Milwaukeean who swallowed a trade dollar two weeks ago, has the coin in his stomach still, but in good health.

* * The John Scott Legacy Medal has been given to C. J. H. Woodbury by the City of Philadelphia in accordance with the recommendation of the Franklin Institute, for the electric testing system for securing safety in the use of electric lighting in mills, which was devised by Mr. Woodbury in connection with his work in charge of the inspection of electric lights for the Boston Fire Underwriters' Union and for the Mill Mutual Insurance Companies.

* * Recent advices from Japan inform us that there are at least a dozen paper mills in that country containing the latest American and European machinery and improvements The paper mill at Osaka has cleared the entire cost of its plant after being in operation only three years, and the mill at Oji declared a 17 per cent. dividend to its shareholders for the twelvemonth. The consumption of paper in Japan is so enormously increasing that, in spite of this rapidly growing domestic production, the imports of paper from the United States and Europe have latterly been greater than ever. Here is a hint for somebody.—*The Paper Trade Journal.*

* * The surplus of unemployed money in the associated banks of New York is still on the increase, and the reserve above that required now amounts to $62,000,000. Money is superabundant; and yet in almost every industry the profit difference between cost and selling price of articles produced is so small, or so often a minus quantity, that capitalists cannot be induced to invest; nor indeed is it desirable that they should seek to increase the productive capacity of industries that now suffer from overproduction. There are, however, profitable industries in which there is no danger of overproduction, and where prudently invested capital will reap a rich reward, and one of the most attractive fields to-day that we could suggest, is that of electric lighting.

* * A new process for the manufacture of steel is attracting much attention among manufacturers because it promises to successfully compete with the Bessemer process. It is called the Clapp-Griffith process, and fourteen plants have already been licensed. The work of the puddlers is done by machinery. The product is a steel very low in carbon, which can be worked and welded as well as the softest iron. One great advantage claimed is that it will utilize the high phosphorus ore of the Lake Superior region at better prices. It is also claimed that this new system will check the importation of ores, as ores high in phosphorus, which have heretofore been of no value, will be available. Puddling will be done away with and considerable labor will be displaced. The reports of manufacturers are all favorable, many declaring that it is superior to anything which has yet been discovered in the iron line.

* * No method has yet been discovered for removing obstacles from pneumatic tubes preferable to that resorted to in Paris. The position of an obstruction is determined by simply firing a pistol into the tube. The resulting wave of compressed air, traversing the tube, strikes the impediment, and is then deflected back to its origin, where it strikes against a delicate diaphragm, its arrival being recorded electrically upon a very sensitive chronograph, on which, also, the instant of firing the pistol had been previously recorded. The wave of sound, on reaching the diaphragm, is recorded and then reflected back, a second time striking the obstacle and returning to the diaphragm. This operation being several times repeated, successive measurements are thus made of the time required by the sound wave to traverse to and fro within the pneumatic tube, and the exact position of the blocking matter is ascertained.

* * "Young gentleman," said the lecturer in chemistry, "coal exposed to the elements loses ten per cent. of its weight and heating power. This is due to the action of the alkali constituents of—"

"But what if there is a dog sleeping near the coal, professor?"

"None of your levity, young man. This is a serious matter."

"That's what dad thought when seventy-two per cent. of his coal pile disappeared during three nights of exposure. Then he asked my advice as a student of chemistry, and I told him to buy a dog, one of the red-headed kind, with bay-window teeth and spring halt in his upper lip and blood in his eye, and now we don't lose one per cent. of our coal a month. That's the kind of a practical chemist I am. Now go on with your theory, and excuse me for interrupting you."

* * Doubtless the increasing popular prejudice existing against monopolies has been caused largely by the oppressive exactions of a few wealthy corporations, and consequently the public mind is ceasing to discern reasonably between just and unjust monopolies, in the same manner that the indiscriminating aversion of the French people was manifested, during their first revolution, towards the whole aristrocratic class. Therefore the present cry of "Down with the monopolists" is analogous to that of "Down with the aristocrats." No one will deny that parents have a monopoly of their offspring for a certain period; but when a person, after a long series of years of arduous mental and manual labor, and often after an immense amount of self-denial and outlay of money, succeeds in giving to the world an invention, the manufacture, operation and use of which benefits hundreds of thousands of people, parties desiring to use the invention, without paying a reasonable compensation, immediately commence to devise schemes by which he may be defrauded of the advantage of the services of the child of his brain, which has been born, sometimes, several decades after its conception.

An illustration of this absence of discernment and justice has occurred recently, in the attempt to compel the New England Telephone and Telegraph Company, by legal enactment, to reduce their rates of rental to a price which would have caused the suspension of the telephone business in this State, and also to subject the said company to a surveillance, with autocratic powers, that never has been delegated to any board of supervisors. Fortunately there were sufficient honesty and intelligence in the Legislature to ensure the overwhelming defeat of such a manifest piece of injustice. Nevertheless, the existence of the chance of such adverse legislation recurring again must have naturally a disheartening influence on the inventive genius of this country. The writer speaks feelingly on this subject, as he, with others, has, after many years of intense thought, labor and expenditure of time and money, succeeded in perfecting an invention that will be of incalculable benefit to the public. Now, if the inventors, after having overcome the other obstacles to the perfection of their inventions, are still liable to the fatal one of having it guillotined, as far as their interests are concerned, by legislation, where is the incentive for others to endeavor to evolve into practical utility the yet undeveloped mechanical resources of the world?

It should be borne in mind that inducements for inventions have been given by statutory enactments, which are tantamount to contracts between the inventors and the public, that can only exist for a few short years, after which the inventions become public property. Under such circumstances it is the acme of injustice to endeavor to debar or limit the rights of inventors by legislation, which would in fact be retroactive.

J. A. W.

—— The Jenney Company, of Indianapolis, are now in the field for business.

—— The Jenney Electric Light Company get $29,000 per annum for lighting the city of Peoria, Ill.

The Absolute Value of the Siemens Mercury Unit, and the Length of the Mercury Column Equivalent to an Ohm.

In the first place, the author corrects the value obtained in 1876–7; according to this correction, the mercury unit is equal to $0.9529 \times 10^9 \frac{\text{cm.}}{\text{sec.}}$ (not 0.9550).

In 1880 and 1882 the author used the so-called Kirchhoff's method of observing the current induced in a second coil on making and breaking the circuit of another coil near it, One coil (*A*) was laid horizontally on the top of a stone pillar, and the other (*B*) was supported co-axially just above it on three legs. Both coils were wound on bronze frames, *A* with 644 turns and *B* with 643 turns of wire 1.86 mm. in diameter. The width of the coils was 4.30 and 4.31 cm. respectively, and the radius of the outside layer 17.618 and 17.670 cm. The induced current was measured by means of a galvanometer specially constructed for the purpose. The mean of the experiments of 1880 gave the mercury unit equal to 0.9498 ohm, and the mean for 1882 0.9500 ohm, or about one-quarter per cent. less than the former determinations. The mean of 50 observations, with a similar but larger apparatus, in 1883 gave the mercury unit equal to $0.9496 \times 10^9 \frac{\text{cm.}}{\text{sec.}}$, the highest and lowest values being 0.9509 and 0.9486. Hence, 1 ohm is the resistance at 0° C. of a column of mercury 1 mm.^{2} in section and 105.32 cm. long.—*Beiblatter.*

Avoidance of Local Magnetic Influence in Measuring Instruments.

The author draws attention to the way in which results may be falsified by the magnetic properties of especially the copper wire used for winding galvanometers or for dampers, as well as of other materials used in their construction. Thus he has found that white marble is diamagnetic, while gray marble is indifferent. The best way of getting over the difficulty in the case of copper wire, etc., is to use only copper which has been electrolytically deposited, and which should therefore be quite free from iron. Also the author recommends that the use of any metal in the immediate vicinity of the needle of any galvanometer should be as far as possible avoided. It is not only the permanent magnetism which has to be considered, but also the temporary magnetism produced by the magnets which are employed in the instrument.—*Electrotechnische.*

Reply to Moller's Proposal for Use of Polarization Photometers.

The exactness of photometric measurements depends on (1) the judgment as to the equal brightness of two sources of light, or of two surfaces illuminated by them, and (2) on the measurement and calculation of the changes in intensity of the two sources of light. The former is the more difficult, and beset with most sources of error. In most cases it is the sensibility of the human eye to light which is used as the means of comparison. The more nearly equal are the two lights, the larger they are within certain limits; and the nearer they are to each other, the less are the errors introduced. Bunsen's method is undoubtedly the safest and best. With a well-trained eye the error for a single measurement can scarcely be reduced below one per cent. A closer approximation may, perhaps, be hoped for by using indirect criteria.

The second class of errors, owing to changes in the intensity of the light, may be more readily dealt with, and can be reduced below the above limit. All photometers which depend on the sensibility of the eye may be divided into two classes—those depending on the law of inverse square of the distance and on polarization. The kind of photometer to be used must depend upon the circumstances; and, if Herr Moller has obtained exceedingly good results with polarization photometers, this is due to the great care taken in the experiments, and it is more than probable that he would have reached equally good results with a Bunsen photometer. At any rate, he is not justified in stating that "only polarization photometers can be used for exact measurement."—*Electrotechnische.*

Western Union Figures.

Messrs. John H. Davis & Co. present an analysis of Western Union receipts and expenditures for the first half of 1881, 1883 and 1884, showing a dividend balance of $2,231,083 in 1881, $5,143,542 in 1883, and $5,503,175 in 1885, and a surplus above dividends of $1,031,083 in 1881, $3,743,792 in 1883, and $4,303,334 in 1885. They add:

"The surplus gained enormously from January 1, 1881, to January 1, 1883, since which time it has gained but little. The revenue for the March quarter decreased 20 per cent., comparing 1885 with 1881; the June quarter decreased in estimated revenue 23 per cent. The net revenue for the first half of 1881 was $3,536,802; the charges and dividends were $2,654,005, leaving a surplus of $882,797. The net revenue for the first half of 1885 is given as $2,758,876; the charges and dividends as $2,687,209, leaving a surplus of $71,667. The actual earnings are reported up to March 31, 1885, when the surplus was $4,246,943. Now, it is not to be supposed that this surplus is in cash or in cash assets. It represents new construc ion. Up to December 31, 1881, the Western Union Company appropriated in each quarter a sum for construction, purchase of patents, etc. It was then voted 'to open a separate account for construction and investments in new properties which go into the plant, and to provide therefor from the surplus assets in the treasury, of which there are more than $8 000,000 in value of available securities. This arrangement will leave all the surplus earnings above fixed charges available for dividends, which is believed to be due to the stockholders.' Dr. Green stated last fall that the bulk of the surplus accrued was represented by new property. The amount invested in new property in 1881 was $1,225,915. If betterments were made in the same ratio in 1882, 1883 and 1884, the expenditure for those years was $3,677,745. The surplus January 1, 1882, was $1,035,273. January 1, 1885, the surplus was $4,231,667—an increase of $3,196,394, or about $500,000 less than the construction account, if the expenditures in recent years have been as large as in 1881. It appears, therefore, that the company up to this year had earned, according to its statements, its dividends, and nearly, if not quite, enough to meet its construction charges. It is evident, also, that the earnings for a year past have not been sufficient to provide for much construction; and, with the present rate of earnings alone, either dividends or construction would have to be reduced. Referring back to the vote in regard to paying for construction, it will be seen that the company claimed to have $8,000,000 in value of securities, out of which it was proposed to provide for construction. If the company has expended its surplus as earned during the past four years in betterments, it may, perhaps, have these securities to fall back on, now that earnings have ceased to be sufficient to provide for dividends and construction at the rate of 1881. Nothing in the company's record of new mileage would indicate that it had spent its surplus earnings and the proceeds of its securities, too. If it has not, there is a fair chance that the securities will take care of new mileage for a while, and that, unless something occurs to reduce earnings considerably, dividends at the rate of 5 or 6 per cent. can be maintained."

The *Daily Indicator* says: A few figures which show the condition of Western Union to-day:

	1883.	1884.	1885.
Net revenues	$7,660,349	$6,610,435	$5,720,251
Interest on bonds	426,817	472,350	495,072
Sinking fund	40,094	39,991	79,991
Total disbursements	$466,911	$512,341	$575,063
Balance	$7,193,438	$6,098,094	$5,145,188
Dividends	5,199,124	5,599,179	4,999,323
Surplus	$1,994,314	$498,915	$145,865

*** The Crescent City Telephone Company, of New Orleans, at present uses the M'Tighe receiver, and the Randall transmitter. The company has 150 subscribers. The central office is supplied with Perrin's multiple switch board.

The Way Incandescent Lamps are Made and the Air Exhausted.

"The way that incandescent lamps are made is very simple," an electrician said recently. "There are different ways of preparing the filaments, which are shaped, carbonized, and treated at a white heat. They are then placed in platinum holders, which are embedded in glass, and next go into the hands of the glass blower. The glass bulbs have round openings at the bottoms and little tubes at the tops. The little tubes all connect with a big tube. This is called a fork, and resembles a cluster of blackberries. Two or three dozen bulbs may be on a fork. The glass blower places filaments in each bulb at the bottom, and welds the glass about the platinum holders to the edges of the opening. Then the air is drawn from the bulbs.

"The open end of the big tube is attached to an air pump, which has forty pounds of mercury at its top. As the mercury drops it carries all the air with it, and vacuums are created in the bulbs. The operator then takes a Bunsen burner and directs its flame against the little tubes close to the bulbs This closes the bulbs, which are then removed from the big tube The glass blower finishes them off. The exhausting of the air from so many lamps at once makes the cost small. The bulbs can be made by any ordinary glass blower, but it requires a man of intelligence to make the filaments."

Solution of Diagrams.

CINCINNATI, June 18, 1885.

Editor Electrical Review:

DEAR SIR: A couple of weeks ago a gentleman called at our office and asked for an estimate on a simple call-bell outfit, with three bells or stations, so arranged that he could call either of the other two stations from each station, and if possible not use more than two, or at most three wires.

In making out the estimate it became necessary to make a diagram of the connections, in order to determine how many and what kind of keys or pushes should be estimated on, and right here was the sticking point. To get the correct diagram for doing the work without making it necessary to run four or five separate lines, is no very easy matter—at least, we found it difficult.

It began to dawn upon us that it was not an easy question to solve; so, after several short but unsuccessful attempts, we determined to "beard the lion in his den," and in the spirit of "dare to do or die" we settled to the task. After a protracted struggle of several uninterrupted and consecutive hours we triumphantly conquered the situation, and produced a solution of the problem.

It impressed us as having some fine points for study in mapping out electrical diagrams; so we presented it to our electrical class at Mechanics' Institute, and have received some two or three satisfactory diagrams.

Thinking it may be of interest to some of your younger readers, who are ambitious to attack electrical questions of this kind, we send you the problem for publication in your paper, if you please:

1. There are to be three bells, one at each of three separate stations, *A*, *B* and *C*.

2. Only one bell must be rung when a call is made. (This is to economize battery power.) For instance: If *A* wants to call *B*, he presses his key and rings *B*'s bell without ringing his own; when *B* answers, he presses his key and rings *A*'s bell without ringing his own.

3. Each station must be able to call both of the others, not *necessarily* by one key, but by one or more keys.

4. Single or double contact point keys may be used.

5. Separate battery may be used at each of the three stations, providing not more than two line wires connect the stations.

6. Three line wires connecting the stations may be used, provided only one battery is used.

7. The bells must all be on open circuit.

8. Either or both ground and metallic circuit may be used.

9. No switches are to be used.

We will cheerfully give our personal attention to any solutions or diagrams offered for our inspection. Yours truly,

C. E. JONES & BRO.

—— The use of the electric light on trains is being tested experimentally by the Pennsylvania Company. The storage batteries and connections add two tons to each train. If the experiments are successful, the electric light will supersede gas on the Pennsylvania Railroad trains. The plant for the manufacture of coal gas in the new Jersey City works is complete, and will be ready in case of emergency.

—— Application was made last Monday in the United States Circuit Court in a suit by the Consolidated Electric Light Company agt. Thomas A. Edison and the Edison Electric Light Company for an injunction restraining the defendants from making, using, or selling the incandescent conductor, made of carbonized fibrous or textile material, for an electric light. E. N. Dickerson, H. R. Garden, and Amos Broadnax are counsel for the plaintiffs. Edison had already brought suits for damages against those who make and use other lamps than his.

—— It is stated that a proposition has been made by the Edison Electric Illuminating Company, of Lawrence, Mass., to furnish that city with as many electric lamps as the number of oil and gas lamps now owned and operated by the city, and twenty-five additional lamps to be placed as directed, the entire care and expense of maintenance to be assumed by the company, who will furnish the current to all the lamps throughout the year during the usual hours of lighting, and to 100 of them the entire night. The poles, wires and other fixtures furnished by the company are to remain its property, and the city is to grant the right of use of such poles as are already set where the rights of others will not be interfered with. The expense to the city under this arrangement will be $650 per month, extra lamps, subsequently ordered, to be furnished *pro rata*. A hearing of the gas company's proposition has been fixed for July 7.

—— We are informed that the following local electrical light companies have consolidated their interests in Boston: The Brush Electric Lighting Company, using the Brush system; the Merchants' Electric Light and Power Company, using the American system, and the New England Weston Electric Light Company, using the Weston or United States system. These companies have now in actual use about 1,500 lights, with capacity for about 2,500 each, having central stations built and equipped in the most complete manner; in fact, the construction of the several plants in Boston, especially their lines and structures, is far superior to anything in this line of work in the country. The management of the Brush and Merchants' Companies held a meeting last week, at which terms of consolidation were agreed upon, and a committee from these companies appointed to confer with the N. E. Weston, later, relative to its joining the combination, which, it is understood, the management of that company is ready and willing to do.

—— In the clock-tower room at the Inventions Exhibition, London, is a small instrument which looks somewhat like one of those little dummy piano keyboards on which beginners may silently practice fingering. This little machine, however, has three rows of narrow keys placed one above another, as the keyboards of an organ are. The spell by which Aladdin summoned the Genius of the Lamp was not more easily worked than that which science has placed in the hands of the controlling spirit here. A touch on the keys, and a tall column of light shoots up from the little island in the middle of the fountain until, on a cloudless night, it seems to reach the sky. A touch or two on other keys, and the innumerable jets of water spring forth to form on a still evening a gracefully tapering pyramid of transparent glistening spray; then, at another order similarly conveyed, all the finer jets are shut off and five shining crystal columns rise and play steadily until the order is given to make them dance, when immediately the center one and the four at the corners alternately rise and fall in rhythmic motion.

ELECTRIC LIGHT NEWS

—— A new electric meter has been patented in Spain by D. Felipe Saldana. It is highly praised by *La Gaceta Industrial*.

—— Complete apparatus for lighting the Ameer's palace by electricity has been despatched from Bombay to Cabul. The electric light took his Highness's fancy at Rawul Pindi, and he decided to introduce it at home.

—— The *Daily Republican*, of Pottsville, Pa., has been investigating the popularity of gas and electricity, and, as a result of the inquiries of a day or two, discovers twenty citizens in favor of gas as a city illuminant, and 703 citizens favoring the electric light. This is one of those instances in which it can be truly said "comment is unnecessary."

—— Mr. Jno. R. Markle, manager Michigan Department Edison Company, has just lighted the first boat ever lighted by electricity in Michigan. It is an excursion boat the Mascotte, built by the Detroit Dry Dock Company, and will run up the Maumee river from Toledo. There are 50 Edison lights on her.

—— Mr. P. P. Deherain's conclusions regarding the influence of the electric light on vegetation are the following: (1) The electric light contains rays which are injurious to vegetation; (2) the greater part of these rays are kept back by transparent glass; (3) the electric light contains, on the other hand, sufficient rays useful to vegetation to maintain the life of plants entirely under its influence for two and a half months; (4) this amount of useful rays is, however, insufficient to bring on young germinating plants, or to bring full-grown plants to maturity.

—— The Consolidated Electric Light Company, of Portland, Maine, in which the American Electric Illuminating Company owns a large interest, has now a steam capacity of 350 horse-power, an engine capacity of 250 horse-power, and is operating 225 lights. The company, through its President, Hon. F. J. Rollins, and its general manager, F. A. Sawyer, has arranged for an increase of the plant to 300 lights capacity. The company already has 50 lights on the streets of Portland, and has just received an order for 50 more. This is somewhat significant and looks favorable for harmonious relations between electric light and gas interests; especially so as the city of Portland owns very nearly one-half of the stock of the Portland Gas Company.

—— Electricity has lately been tried for train lighting in Germany, at Frankfort-on-the-Main. The experimental train consisted of a first, second, and third-class carriage, and a luggage-van containing a Mochring dynamo and twenty-six accumulators. The dynamo was driven by pulleys and belts from the axle of the wheels of the van at a speed of 700 revolutions per minute, when the train was running at a speed of 18 to 42 miles per hour. When the speed was less than 18 miles per hour the lamps were thrown out of circuit with the dynamo and accumulators, and fed from the accumulators direct by an automatic commutator. During the day the accumulators were charged with the lamps out of circuit. The installation cost £125, and weighed about 12 cwt. There were twelve incandescent lamps in all, and the cost of fitting up each carriage is estimated at from £3 to £4. The experiments demonstrated that the electric light is capable of lighting trains in motion and during stoppages; and the cost is estimated at about 1d. per lamp per hour. The trials continued for six weeks, and as everything was done automatically except at starting, the attendance required was slight. The difficulty of breaking up a train and shunting on to a new line while keeping the carriage lighted does not, however, seem to have been dealt with in these experiments.

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING JUNE 16, 1885.

319,947 Electric tramway; Carlos Basto, Rio de Janeiro, Brazil.

319,998 Conduit for electrical conductors; Chas. G. Perkins, New York, N. Y., assignor to the Imperial Electric Light Co., same place.

320,017 Cut-out for electric circuits; Elihu Thompson and E. Wilbur Rice, New Britain, Conn., assignors to the Thomson-Houston Electric Co. of Connecticut.

320,018 Electric lamp; Elihu Thomson, Lynn, Mass.

320,019 Switch; Erastus C. Titus, Catskill, N. Y.

320,025 Electric Locomotive; Joseph Weis, Jersey City, N. J.

320,026 Socket, or holder for incandescent lamp; Edward Weston, Newark, N. J, assignor to the United States Electric Light Company, New York, N. Y.

320,027 Socket, or holder for incandescent lamps; Edward Weston, Newark, N. J., assignor to the United States Electric Light Company, New York, N. Y.

320,028 Circuit breaker; Edward Weston, Newark, N. J., assignor to the United States Electric Light Co., New York, N Y.

320,029 Incandescent lamp holder; Edward Weston, Newark, N. J., assignor to the United States Electric Light Co., New York, N. Y.

320,030 Holder for incandescent lamps; Edward Weston, Newark, N. J., assignor to the United States Electric Light Co., New York, N. Y.

320,065 Electric lighting attachment for gas fixtures; Charles A. Hussey, New York, N. Y., assignor of one-half to Joseph Snyder, Philadelphia, Pa.

320,092 Electric car; Anthony Reckenzaun, London, England, assignor to Frederick Reckenzaun, New York, N. Y.

320,105 Apparatus for turning on, lighting, and shutting off gas by electricity; LeRoy S. White, Waterbury, Conn.

320,106 Apparatus for turning on, lighting, and turning off gas by electricity; LeRoy S. White, Waterbury, Conn.

320,117 Electric Lamp and socket switch; David H. Cunningham, Elizabeth, N J.

320,170 Dynamo-electric machine; Jose M. Rivera, Bugo, United States of Colombia.

320,200 Electric sight for firearms. Walter Winans, Brighton, County of Sussex, England.

320,229 Electric cable; Patrick B. Delany, New York, N. Y.

320,232 Secondary Battery; James DuShane, South Bend, Ind.

320,234 Regulator for dynamo-electric machines; M. G. Farmer, New York, N. Y.

320,238 Electrical push-button; John Geary, Philadelphia, Pa.

320,272 Type-setting machine; James E. Munson, New York, N. Y.

320,275 Electrical device to enable showmen to walk on the ceiling; Clyde H. Newman and Wm. Berrigan, Rochester, N. Y.

320,283 Electrically actuated railway system; Frank L. Pope, Elizabeth, N. J.

320,285 Electric igniter for gas engines; Daniel S. Regan, San Francisco, Cal.

320,311 Repeater for quadruplex telegraphs; Thomas R. Taltavall, Brooklyn, N. Y.

320,376 Type wheel for printing telegraphs; Carl A. Mathiesen, New York, N. Y.

320 377 Process of electrically depositing nickel; Jean A. Mathieu, Leyden, N. Y.

320,414 Telephone circuit; Henry S. Thornberry, Boston, Mass.

320,438 Telephone support; Thomas W. Lane, Boston, Mass.

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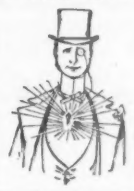

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It will make a very convenient desk volume.—*The Brush Electric Light and Power Co. of Niagara, Niagara Falls.*
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